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(54) STEREOMICROSCOPE ALLOWED TO BE UBSERVED BY PLURAL OBSERVERS

(57) Abstract:

PROBLEM TO BE SOLVED: To arrange each eye point on a position close to an object with respect to a stereomicroscope allowed to be observed by many observers by arranging a face intersecting with the light division face of a reflection member for dividing a beam emitted from a variable power optical system into a transmitted beam and a reflected beam on the inside of the beam emitted from the variable power optical system.

SOLUTION: A beam exited from an afocal relay system is divided into three components, i.e., center, right and left transmission/reflection, by a three-division prism 22. The prism 22 is constituted so that the intersection lines of reflection faces of light division prisms 22L, 22R intersect with the exiting optical axis of the relay system. A beam transmitted to a main observation side through the prism 22 is made incident upon a main observation side roof prism 23. On a right sub-observation side, a beam made incident upon the prism 22R is reflected by its internal half mirror face and made incident upon a sub-observation side roof prism 28 and the movement of its image center is reduced by a wedge prism 30. A sub-observation side lens barrel 21 is arranged on the exit side of the prism 30. The left sub-observation side and the right sub-observation side are mutually sym-meterial and have the same action.

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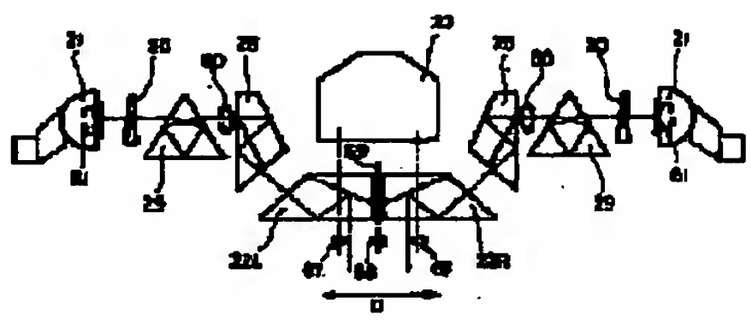

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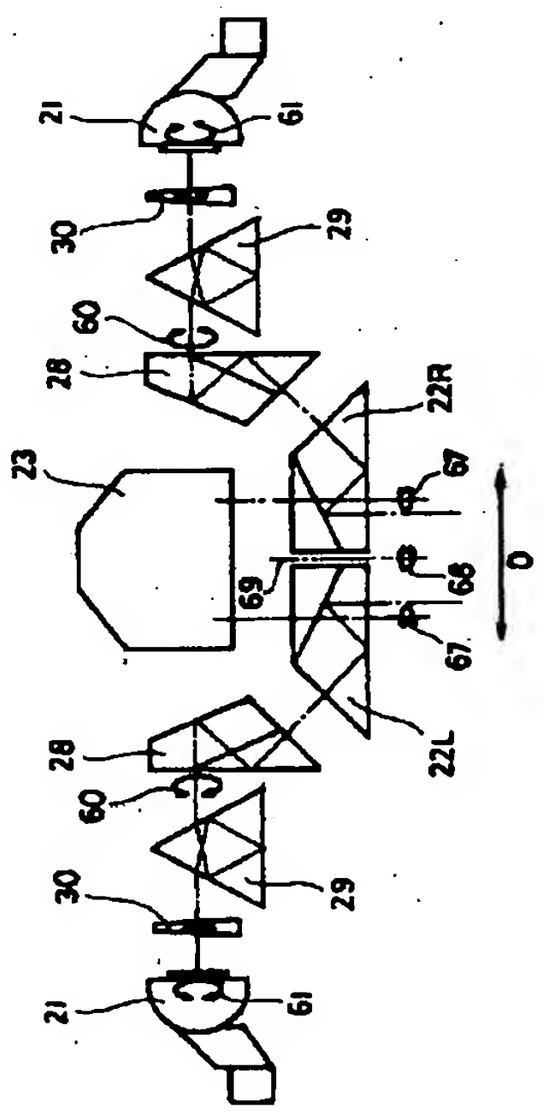
(54)【発明の名称】　複数人で観察可能な実体顕微鏡

(57)【要約】
【課題】　多数の観察者による観察が可能で、アイポイントが物体に近くなるようにする。
【解決手段】　変倍光学系よりの光束を透過側と反射側とに分ける光分割部材を有し、一つの反射部の光分割面もしくはその延長した面と他の反射部の光分割面もしくはその延長した面とが交差する面が変倍光学系からの光束の内側にあるようにした。



【特許請求の範囲】
【請求項１】対物レンズ系と、変倍光学系と、鏡筒光学系とよりなり、前記対物レンズ系と変倍光学系との光軸が一致しかつ少なくとも一つの結像点を有し、前記鏡筒光学系は、左右一対の開口絞りと結像レンズと接眼レンズとよりなり、前記左右の開口絞りにより夫々決定される左右観察光軸が変倍光学系の光軸と異なるところを通る実体顕微鏡において、前記変倍光学系からの光束を透過と反射とに分ける光分割面を有する反射部材を有し、前記反射部材のうちの一つの反射部の光分割面もしくは光分割面を延長した面と他の反射部材の光分割面もしくは光分割面を延長した面とが交差する面が前記変倍光学系からの光束の内側にあることを特徴とする実体顕微鏡。
【請求項２】対物レンズ系と、変倍光学系と、鏡筒光学系とよりなり、前記対物レンズ系と変倍光学系とは光軸が一致しており、かつ少なくとも一つの結像点を有し、前記鏡筒光学系は、左右一対の開口絞りと結像レンズと接眼レンズとよりなり、かつ前記一対の開口絞りにより夫々決定される左右の観察光軸が前記変倍光学系の光軸と異なるところを通る実体顕微鏡において、前記実体顕微鏡が立体撮像系を備え該立体撮像系による立体画像が前記鏡筒光学系による観察像に対応していることを特徴とする実体顕微鏡。
【請求項３】対物レンズ系と、変倍光学系と、鏡筒光学系とよりなり、前記対物レンズ系と変倍光学系との光軸が一致しかつ少なくとも一つの結像点を有し、前記鏡筒光学系は、左右一対の開口絞りと結像レンズと接眼レンズとよりなり、前記左右の開口絞りにより夫々決定される左右観察光軸が変倍光学系の光軸と異なるところを通る実体顕微鏡において、前記実体顕微鏡が第１の光路と第２の光路からなる一対の光路を有する立体撮像系を備え、前記立体撮像系が光束を１回結像する結像光学系を有し、前記立体光学系の開口絞りが前記鏡筒光学系の開口絞りとほぼ一致することを特徴とする実体顕微鏡。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、変倍光学系を含む共通の光学系の後方にて左右の目のための光束に分ける左右一対の開口絞りを有し、左右の光束を左右の目で立体観察を行なう実体顕微鏡に関するものである。
【０００２】
【従来の技術】実体顕微鏡は、物体を拡大観察でき、しかも立体的情報を得ることができるために、物体に対する作業を行なう際に有効であり特に手術用顕微鏡として用いることが有効である。
【０００３】このような実体顕微鏡について、手術用顕微鏡を例として述べる。
【０００４】手術用顕微鏡は、より困難な手術を可能にするため、複数の観察者が像を同時にしかも自由な方向より観察し得る構成であることが望まれている。
【０００５】この要求に応じるために、左右の目で見る夫々の像を形成する光束を一つの変倍光学系を通すようにした手術用顕微鏡の例として、特開平４－１５６４１２号公報に記載されている手術用顕微鏡が知られている。この従来例は、変倍光学系の後方に設けられた左右光路用の開口絞りを変倍光学系の光軸の周りに回転させることにより観察方向を自由に変えることができ、又複数の観察者による観察が可能な構成のものである。
【０００６】又、他の従来例として、特開平９－３１８８８２号公報に記載された実体顕微鏡が知られている。この従来例は、前述の変倍光学系の後方にリレー系配置して収差を良好に補正するようにしている。そのために長くなった光路長を反射部材を設けることにより光束を折り曲げてアイポイントを物体側に下げるようにしている。又、変倍に伴う立体感の変化を少なくするために、絞りを開口と共役の位置におくようにしている。
【０００７】図１０は、自由な方向からの観察を可能にした実体顕微鏡の一例を示す図である。図において、１はハーフミラー、２は対物レンズ、３は立体感調整絞り、４，５，６は夫々反射部材、７はアフォーカルズーム系、８は光分割部材、９は反射部材、１０はリレー系第１レンズ、１１，１２，１３は反射部材、１４はリレー系第２レンズである。
【０００８】このような従来の実体顕微鏡において、ハーフミラー１の物体側とは反対側（図においてハーフミラー１の上方）には観察物体の観察軸と同軸で照明するための照明装置が設けられている。この照明装置により照明された物体よりの光束は、ハーフミラー１により反射され対物レンズ２を通ってアフォーカル光束になる。このアフォーカル光束は、変倍に伴う立体感の変化を抑えるため立体感調整用絞り３と経て、反射部材４，６により反射されて図面上方に向かう。反射部材６の後方に配置されている対物レンズ２と同軸のアフォーカルズーム系７を通った後に光分割部材８により分割される。つまりアフォーカルズーム系７を射出した光束は、光分割部材８により反射され、反射部材９により反射され図面の下方に向けられ、その後アフォーカル光束を結像させるリレー系の第１レンズ１０により物体像を形成した後、反射部材１１，１２，１３により夫々反射されて物体からの入射光軸（ハーフミラー１への入射光軸）の延長線上を図面上方に向けられ、入射光軸にほぼ平行になる。これにより、光路長の長い光学系を用いた場合でも物体位置と観察者の目の位置とを近づけることができ、アイポイント位置を下げることができ、普通の実体顕微鏡と同等に扱うことを可能にしている。この光学系において、リレー系の結像点付近にレンズを配置すれば瞳位置の調整が行ないやすい。
【０００９】次に、本発明の実体顕微鏡のように複数の観察者による観察を行なう中間鏡筒部分の従来例として

２人観察用に光束を分割する中間鏡筒部分に関して図１１をもとに述べる。

【００１０】図１１において、１５は主観察側と副観察側に分割するビームスプリッター、１６は主観察側に設けられたダハプリズム、１７は主観察側の鏡筒である。又１８は平行四辺形のプリズム、１９は３回反射のダハプリズム、２０はイメージローテータ、２１は副観察側鏡筒で、これらにより副観察側の光学系を構成している。

【００１１】この図１１に示す中間鏡筒部分においては、１回結像リレー系を射出後の光束のうちビームスプリッター１５に入射し、このビームスプリッターを透過する光束は、主観察側へ向う。つまり、ビームスプリッター１５を透過した光束は、正立のダハプリズム１６により正立像とされた後、主観察側鏡筒１７に入射して主観察者により観察される。

【００１２】又、ビームスプリッター１５にて反射された光束は、副観察側へ向うもので平行四辺形のプリズム１８へ入射し、これを射出後ダハプリズム１９を通って正立像になり、イメージローテーター２０を通ってから副鏡筒２１に入射して副観察者にて観察される。

【００１３】以上の通りの副観察側の中間鏡筒は、主観察側と適切な距離だけ離すために平行四辺形のプリズムを用い、リレー系の光軸を回転軸として回転可能にし、平行四辺形状のプリズム１６とダハプリズム１９との間の光軸を回転軸として回転可能にしてダハプリズム１９より後方の光学系を回転させこれと同時にこの回転の２倍の角度で副観察側鏡筒を回転させることにより、像の回転なしに覗く方向を変えることができる。また開口部は、光路長が主観察側とほぼ一致するように、主観察側と副観察側の鏡筒１９と２１からはずれた位置にあり、イメージローテータの小型化を考慮して開口部はイメージローテータ２０の前に設置してある。

【００１４】この中間鏡筒を用いれば、２人の観察者により同時に観察が可能である。又分割部を数段重ね配置することにより、３人以上の観察者による同時観察も可能になる。

【００１５】この中間鏡筒を用いた実体顕微鏡を手術用に用いれば複数の手術者の参加が可能である。しかし、手術者と術部との距離は短い方が望ましい。又手術者が３人であれば、より高度な手術が可能になり、物体と目とが３人共近くかつ像の明るい顕微鏡が望まれる。

【００１６】しかし、この従来例では、これら要求を十分に満足するとはいえない。

【００１７】また目に見えない光や微弱な光から手術に有効な情報が得られ、例えば赤外線で観察すると皮膚が透明になり血管の位置が明確になり、又蛍光観察により癌細胞が特有の蛍光を発することがある。これらを観察するためにはテレビ画像が有効であり、テレビ画像は、輪郭強調や色強調により僅かな差を強調でき判定しやすくなる。これらテレビ画像は、複数の手術者に立体観察できる状態で提供して手術時に作業しながら確認できることが望ましい。しかもテレビ撮影位置が、作業の邪魔にならないように配置され小型であることが望ましい。

【００１８】

【発明が解決しようとする課題】本発明の第１の目的は、多数の観察者により観察を行なう実体顕微鏡で、アイポイントが手術面に近い位置にくるようにした実体顕微鏡を提供することにある。

【００１９】本発明の第２の目的は、観察者の観察方向に合わせた立体撮像ができる実体顕微鏡を提供することにある。

【００２０】本発明の第３の目的は、多数の観察者による観察および立体撮像を可能にし、小型な撮像装置とした実体顕微鏡を提供することにある。

【００２１】

【課題を解決するための手段】本発明の実体顕微鏡は、対物レンズ系と、変倍光学系と、鏡筒光学系とよりなり、前記対物レンズ系と変倍光学系との光軸が一致しかつ少なくとも一つの結像点を有し、前記鏡筒光学系は、左右一対の開口絞りと結像レンズと接眼レンズとよりなり、前記左右の開口絞りにより夫々決定される左右観察光軸が変倍光学系の光軸と異なるところを通り、変倍光学系からの光束を透過と反射とに分ける光分割面を有する反射部材を有し、前記反射部材のうちの一つの反射部の光分割面もしくは光分割面を延長した面と他の反射部材の光分割面もしくは光分割面を延長した面とが交差する面が前記変倍光学系からの光束の内側にあることを特徴とする。

【００２２】即ち、本発明は例えば図１０に示すような対物レンズ系と変倍光学系と更に鏡筒光学系とよりなり、対物光学系と変倍光学系の光軸が一致しており、かつ少なくとも一つの結像点を有し、鏡筒光学系が左右一対の開口絞りと結像レンズと接眼レンズとよりなるもので、多数の観察者により同時に観察することを可能としたものである。

【００２３】そのために、本発明の実体顕微鏡は、例えば前記図１０に示す対物レンズ２とそれと同軸に設置されたアフォーカル変倍系７と、１回結像アフォーカルリレー系１０～１４からなる構成のものの、前記アフォーカルリレー系射出後の光束を例えば図１、２に示すような３分割プリズム２２を用いて中央から２分して左方向透過・反射、右方向透過・反射に３分割したものである。そして左方向に反射する面と右方向に反射する面との交線が１回結像のアフォーカルリレー系の射出光軸と交わるようにしたことを特徴としている。これによって分割プリズムを小型化でき分割プリズムを透過する側である主観察者のアイポイントが物体から離れないようにすることができ、又全体の像の明るさの減少を少なくし得る。また、分割プリズムによる分割を増やして更に多

くの観察者による観察を可能にした場合も、各分割面の境界がリレー系の第２レンズ（図２におけるレンズ１４）より射出する光束内に例えば図１の幅Ｄの光束内に位置するようにすれば、同様の効果が得られる。

【００２４】又、本発明の実体顕微鏡の他の構成は、前述の通り対物レンズ、変倍光学系、鏡筒光学系等よりなるもので、更に立体撮像系を設け、この立体撮像系による立体画像が鏡筒光学系による観察像に対応するようにしたことを特徴としている。

【００２５】そのため、鏡筒光学系を複数設け、その観察光学系にそれぞれに対応した立体撮像を行なうようにし撮像された立体像を観察し得るようにした。つまり、立体テレビ光学系の前に反射回数と瞳の位置とを合わせる反射部材を設けた構成とし、これを副観察側の左右のいずれかの鏡筒の代りに設置して使用する。この場合、立体テレビ光学系を設置した鏡筒と他の鏡筒とが観察位置が変らないように連動させることが好ましい。又テレビ撮影系を図１０に示す光分割部材８の透過側に配置して、これと主観察側鏡筒とが連動して動くようにしてもよい。このようにして、主観察側、副観察側のいずれも、テレビ像と観察像とを切り替えても観察位置に差がないようにすることができる。

【００２６】このように構成することにより、肉眼では見えない光で形成された像や、暗くて確認しにくい像や、画像処理により強調した像等を観察像と切り替え観察し又は重ねることによって、作業上違和感なく間違えが少なく効率的な作業が可能である。

【００２７】次に本発明の実体顕微鏡の他の構成で、前述の通りの実体顕微鏡に第１の光路と第２の光路からなる一対の光路を有する立体撮像装置を備えており、この立体撮像装置は、光束を１回結像する結像光学系を有し、立体撮像装置の開口絞りが鏡筒光学系の開口絞りとほぼ一致するようにしたことを特徴としている。

【００２８】即ち、例えば図１０に示す構成の光学系における光分割部材８の透過側又は、例えば図１に示す左右の副観察側鏡筒２１のうちの一方にテレビ撮影系を取り付けるようにしたもので、観察側の瞳と撮影系の開口絞りとを一致させるようにする必要がある。そのため、本発明では撮影系内部にて１回結像させて開口絞りを設けその物体側に開口絞りの共役位置を設けるようにした。その際に左右の光路長とを合わせるために図５に示す通りの構成にした。つまり光路長を調整するため両光路の光軸が平行になる部分を設け、この光軸が平行な区間に設けられた反射部材を移動させることにより光路長を調整し、この移動量の２倍に光路長が延びるようにして大きな変更なしに光路長を調整し得るようにした。この部分は、図５に示す構成では、左目用光路の反射部材３７Ｌの入射光軸から反射部材３８Ｌの射出光軸までであり、又右目用光路の反射部材３６Ｒの入射光軸から反射部材３７Ｒの射出光軸までの部分である。これにより小型のまま調整が可能になる。更にこの構成を左右の光学系の両方に採用すれば、平行の光軸により決まる平面が直交するため小さい容積での配置が可能になる。

【００２９】

【発明の実施の形態】次に本発明の実体顕微鏡の第１の実施の形態について述べる。

【００３０】本発明の第１の実施の形態は、変倍光学系を射出する光束を分割して複数の観察者による観察を可能にするもので、例えば図１０に示す光学系（対物レンズや変倍光学系等を含む光学系）のリレー系の第２レンズ１４より射出する光束を光分割部材によって複数に分割して多くの観察者により観察することを可能にする構成のものである。

【００３１】図１，図２は、本発明の実体顕微鏡の第１の実施の形態で変倍光学系を射出する光を主観察側と二つの副観察側とに分割する分割系を示し、これら図１、２は一例として光束を３分割する分割系である。

【００３２】図１は副観察側を示し、１４はリレー系の第２レンズ、２２Ｌ，２２Ｒは夫々第２レンズ１４よりの光束を分割するための光分割部材（光分割プリズム）で、この分割部材により透過側つまり主観察側（図２）と左右の反射により二つの副観察側の３方向に分割する。この光分割プリズム２２Ｌ，２２Ｒの反射面の交わる線（交線）とリレー系第２レンズ１４の射出光軸とが交わるように構成されている。これにより、左右の副観察側に均等に光を分割することが可能になる。この光分割プリズム２２を透過する主観察側への光束は、図２に示すように主観察側ダハプリズム２３へ入射し、このダハプリズム２３により１８０° 回転させる鏡筒が取付けられる。鏡筒は結像レンズと正立光学系と眼幅調整機構を有し、傾斜角が可変である。この状態で立体観察調整絞りとアフォーカルズーム系の最高倍率のときの共役の位置に開口絞り２５が配置されており、最高倍率の時に立体感が大きくなるのを抑えるようにしている。

【００３３】光分割プリズム２２Ｌ，２２Ｒで反射した左右の副観察側は、リレー系の第２レンズ１４の射出光軸を含む面に対して対称に配置されている。

【００３４】次に、この第１の実施の形態の副観察側について更に詳細に述べる。右副観察側では、リレー系の第２レンズ１４より光分割部材２２Ｒへ入射した光束が、その内部のハーフミラー面にて反射された後にさらに１回内部にて反射され光分割部材２２Ｒの入射光軸に対して４５° 傾いた方向に射出される。この光分割部材２２Ｒを射出した光束は、副観察側ダハプリズム２８に入射し、内部で反射面とダハ面により計３回反射された後光分割部材２２Ｒの入射光軸に対して垂直な方向につまり水平面の方向に射出される。続いて楔プリズム３０が配置されこれにより像心の移動を少なくしている。つまりこの楔プリズム３０によりイメージローテータプリズム２９の加工精度不足を補い、イメージローテータプ

リズムを安価になし得る。この楔プリズム３０の射出側には副観察側鏡筒２１が設けられている。

【００３５】この副観察側鏡筒２１は、主観察側鏡筒と異なり開口絞りを有していないが、それ以外は主観察側鏡筒と同じである。開口絞りは、例えば図１０に示す立体感調整絞り３のアフォーカルズーム系７が最高倍率の時の共役位置に設けられ、この実施の形態の光学系では楔プリズム３０と副観察側鏡筒２１との間に位置している。尚、左副観察側は、右副観察側と対称であって、その作用は同じである。

【００３６】又、開口絞りと鏡筒の像面とにより決まる光軸（観察光軸）は、光分割部材２２Ｒの主観察側光軸よりに設定されており、図９に示す通りである。図９はリレー系の第２レンズ１４側から光分割プリズム２２Ｌ，２２Ｒを見た図であり、主観察側の左目用開口部５４Ｌ、右目用開口部５４Ｒ、左副観察側の左右の目用の開口部５５Ｌ，５５Ｒ、左右観察側の目用の開口部５６Ｌ，５６Ｒを示している。又、リレー系の第２レンズ１４の射出光束５７は、倍率があがるにつれて立体感調整絞りにより狭められて最高の倍率では、射出光束５８になる。このように配置することにより、光分割部材２２Ｌ，２２Ｒにより光束が狭められ、視野周辺の減光や像のけられを少なくすることができる。

【００３７】ここで図９に示すように鏡筒の光軸間隔をＡとし、左右の副観察側の左右観察光軸を含む面の距離をＢとするとき、下記条件を満足すれば視野周辺の減光が少ない。

【００３８】０．６≦Ｂ／Ａ≦０．８

視野周辺に多少視野周辺の減光が生じた場合でも、結像レンズの焦点距離を長くしたり、又は接眼レンズの倍率を上げる等して鏡筒光学系の倍率を上げることにより視野を狭くすれば視野周辺の減光をなくすことができる。

【００３９】また、副観察側の光学系は、イメージローテータプリズム２９と楔プリズム３０とを一体にして左目用と右目用の二つの観察光軸の中間の軸を回転軸にして回転できるようになっていて、つまり図１の６０に示すように回転し得るようになっていて、第１の回転部を構成している。また開口絞りを含む副観察側鏡筒２１も左右の観察光軸の中心を回転軸として符号６０に示すように回転できるようにして、第２の回転部を構成している。

【００４０】前記の第１の回転部の回転角α１と第２回転部の回転角α２とを下記の関係で回転させれば像の回転なしに鏡筒を回転させることができる。

【００４１】α１：α２＝１：２

これは、主観察側の観察者が鏡体を前後に傾けた場合の副観察者の像補正として有効である。

【００４２】また、光分割部材２２Ｒと副観察側ダハプリズム２８の間の左右の観察光軸の中間を回転軸に副観察側ダハプリズム２８から副鏡筒２１までを、図１の６７で示すように回転させることにより、観察方向を多少変えることができる。この場合、反射面の境界は、リレー系の第２レンズ１４の射出光軸上にならないが、射出光束内の反射面にはこの反射面の境界が含まれる。同様に、光分割部材２２Ｒの入射側の左右観察光軸の中間の軸を回転軸に光分割部材２２Ｒから副観察用鏡筒２１までを一体にして多少回転させることにより観察方向を少し変えることができる。

【００４３】また、左右の副観察側を一体にして、リレー系の第２レンズ１４の射出光軸を回転軸として図１の６８に示すように回転させることにより３人の観察位置を変えることができる。このとき、主観察側は副観察側の動きに連動して動かない方が好ましい。

【００４４】次に、本発明の実体顕微鏡の第１の実施の形態における主観察側について、その一例としての３人観察部（３分割）のものについて述べる。

【００４５】この第１の実施の形態の主観察部は、図２に示す通りの構成であって、図１０に示すハーフミラー１の光軸に垂直な方向（以後シフト方向と呼ぶ）にハーフミラー１への入射光軸の延長上から接眼レンズのアイポイントが離れないようにした例である。つまりハーフミラー１への入射光軸から観察者の目が離れないようにした例である。接眼レンズのアイポイントは、前記入射光軸より離れてもよいがハーフミラー２の入射光軸方向は観察者の目に近い方が観察しながらの物体への各種作業を行なうためには好ましいとの観察者の要望が強いことによる。この第１の実施例は、この要望に沿った構成にしたものである。即ち、主観察側のダハプリズム２３は、図１に示す副観察側のダハプリズムと同じであるが、主観察側ではこのダハプリズム２３より射出する光束を２回反射の反射プリズム２４を通してシフト方向に反射するようにしている。この反射プリズム２４を射出後に開口絞り２５を設置してある。これは、立体感調整絞りのアフォーカルズーム系の最高倍率でリレーする位置に設置してある。この開口絞り２５の像側には内部に開口絞りがない主観察側鏡筒２１が取付けられている。

【００４６】この主観察側の第１の実施の形態は、以上のような構成にすることによってアイポイントが入射光軸方向に近づき、シフト方向に離れた位置になる。

【００４７】又、左右の開口絞り２５の中間の軸を回転軸にして主観察側鏡筒２１を図２に符号６２にて示すように回転させることにより主観察者が任意の向きでの観察が可能になり楽な姿勢での観察が可能である。

【００４８】又、前述の第１の実施の形態の副観察側における左右の副観察用の光束は、光分割部材（２２Ｌ，２２Ｒ，）で別の面を通るので、心や同焦において差が生じ、これを補正するためには、主観察側の反射部材２４と鏡筒２１の間にアフォーカル変倍レンズを挿入し、この変倍レンズにより心および同焦の調整をすればよい。尚、後に示す第２の実施の形態においても同様であ

る。
【００４９】図３、図４は本発明の第２の実施の形態の主観察側および副観察側の構成を示す図である。
【００５０】図３は、第２の実施の形態における３人観察用を例として主観察側の光学系を示した図である。この光学系は、図４に示す光分割部材３１により分割され反射された後の出射光束を２回反射のための反射面を互いに平行に配置したものである。つまり光束出射後に二つの反射部材（反射プリズム）２６および２７を配置し、これら反射プリズムをその反射面が互いに平行になるように配置した。これによって、ダハプリズム２３を出射した光の光軸と平行のままアイポイント位置の調整が可能になる。又、２回反射のプリズムを二つのプリズム２６，２７にて構成することにより立体感調整絞りとほぼ共役の位置である両プリズムの間に開口絞り２５を設置し得るようにした。又開口絞り２５を通過後プリズム２７にて反射してダハプルズム２３の出射方向と平行な方向に出射した光束の位置に主観察側鏡筒２１を配置し、この鏡筒に、第１の実施の形態と同様にアフォーカル変倍レンズを設けることにより、心や同焦の調整を可能にした。又、反射プリズム２７と鏡筒とを反射プリズム２６の出射方向に許容範囲内で移動させることが可能であるが、許容範囲を超えると像のけられが生ずるため好ましくない。又開口絞り２５も許容範囲内での移動が可能であるが、許容範囲を超えると像面での左右の明るさの差が大になる。このような鏡筒等の移動により、観察者はアイポイントの入射光軸方向とシフト方向の位置を自由に選ぶことができ、適切なアイポイントが得られる。この場合、連続な調整ではなく、反射プリズム２６と２７の間に間隔を離すための特定のユニットを挿入することにより調整を行なってもよい。この手段によれば、突出部を有する鏡筒の干渉を防止し得る。
【００５１】図４は、本発明の実体顕微鏡の第２の実施の形態における３分割式を例とした分割部（副観察側）の光学系を示す図である。この実施の形態は、左右の副観察側のアイポイントが低くなるようにした例で、そのため光分割部材３１より出射する光束の角度が水平に対して３０°になるようにし、又反射プリズム３２と副観察側の２回反射ダハプリズム３３により、このダハプリズム３３より出射する光束が水平方向になるようにしてある。又この実施の形態では、ダハプリズム３３の出射後に第１の実施の形態と同様にイメージローテータプリズム２９と楔プリズム３０を、更に鏡筒２１を配置した構成になっている。
【００５２】以上のように、この第２の実施の形態の副観察側は、光分割の射出角を小さくしたことにより副観察側のアイポイントが低くなっている。又、分割プリズム３１の左右のハーフミラー面の交線は、リレー系第２レンズ１４の射出光軸の延長上にくるようにしてある。この光軸を回転軸にして副観察側だけを図４の６８に示すように回転させることが出来る。この場合、反射面の境界は、リレー系の第２レンズ１４の射出光軸上にならないが射出光束内の反射面内にはこの反射面の境界が含まれる。
【００５３】以上述べた第１、第２の実施の形態を示す図１乃至図４は、いずれも一つの光軸しか図示していないが、いずれも左目用および右目用の光学系よりなり、したがって左右二つの光路（光軸）を有する光学系である。なお、図１や図４に示した副観察側の光学系と図２及び図３に示した主観察側の光学系は、それぞれ自由に組み合わせて使用することができる。また、図４の副観察側の光学系は、回転軸６９で左右に分離した構成にすることも可能で、この場合、副観察側の光学系の一つを図１の副観察側の光学系に置き換えて使用することもできる。このように２つの光学系に分けた場合、図１と同様に、個々の副観察側の光学系を独立して回転させることも可能になる。なお、図１においても、副観察側の光学系の一つを図４の副観察側の光学系に置き換えることもできる。
【００５４】次に本発明の実体顕微鏡において、立体撮影系を用いての立体画像を得るようにしたもので、この立体画像が観察像に対応するようにした構成の実施の形態である第３の実施の形態について述べる。
【００５５】図５は、この本発明の実体顕微鏡の第３の実施の形態の斜視図である。この図において３４Ｌ，３４Ｒは左右の観察系の結像レンズ、３５Ｌ，３６Ｌ，３７Ｌ，３８Ｌ，４０Ｌおよび３５Ｒ，３６Ｒ，３７Ｒ，３８Ｒ，４０Ｒは夫々左右の観察系の反射部材（反射プリズム、全反射プリズム、反射ミラー）、３９Ｌ，４１Ｌおよび３９Ｒ，４１Ｒは夫々左右のリレー光学系である。
【００５６】図示する光学系において、左目観察用の光路は、撮影系結像レンズ３４Ｌを透過し、反射部材（反射プリズム）３５Ｌにより撮影系結像レンズ３４Ｌの光軸を含む面に垂直な方向に反射し、反射部材（反射プリズム）３６Ｌにより反射部材３５Ｌの入射と射出の左目用撮影光軸に垂直方向に反射され次に反射部材３６Ｌにより反射部材３５Ｌの入射と射出の左目用撮影光軸に垂直方向に反射し、反射部材３７Ｌにより左目結像レンズ３４Ｌ通過の左目用撮影光軸に平行な方向に反射され、反射部材（反射プリズム）３８Ｌの反射面により反射部材３６Ｌと反射部材３７Ｌの間の左目用撮影光軸に平行な方向に向けられ、反射部材（反射プリズム）４０Ｌの反射面により反射部材３５Ｌと反射部材３６Ｌの間の左目用撮影光軸に平行な方向に光束を向ける。又反射部材（反射プリズム）４２Ｌは、テレビカメラの位置に合わせて取付けた反射部材で、小型のテレビカメラを取り付ける場合は設ける必要はなく、反射部材４０Ｌの射出光軸の延長上に取り付けてもよい。又５９Ｒは左目側の撮像面である。

【００５７】一方右目用観察系は、光束が左目用結像レンズ３４Ｒを透過後反射部材３５Ｒの反射面により反射部材３５Ｌと反射部材３６Ｌの間の左目用撮影光軸と平行であって入射する左右撮影用光軸を含む面に対し反対方向に反射する。この面で反射された光束は、反射部材３６Ｒの反射面により反射部材３６Ｌと反射部材３７Ｌの間の左目用撮影光軸と平行で同じ向きの方向へ反射される。次に光束は、反射部材３７Ｒの反射面により反射部材３５Ｒと反射部材３６Ｒに平行で反対方向に向けられ、反射部材３８Ｒにより反射部材３７Ｌと反射部材３８Ｌと平行で同じ向きに反射され、反射部材４０Ｒにより反射部材４０Ｌと反射部材４２Ｌの間の左目用光軸と平行で同じ向きに反射される。更に光束は、反射部材４２Ｒも左目用反射部材４２Ｌと同様にテレビカメラの大きさによっては省略してもよい。又５９Ｒは右目側の撮像面である。

【００５８】以上述べたように左右の撮影光学系によ

r_1 =52.2595	d_1 =3.8000	n_1 =1.52249	ν_1 =59.84	
r_2 =-25.8263	d_2 =2.2000	n_2 =1.61293	ν_2 =36.99	
r_3 =-92.6980	d_3 =4.0000			
r_4 =∞	d_4 =20.0000	n_3 =1.56883	ν_3 =56.36	
r_5 =∞	d_5 =19.0000	n_4 =1.56883	ν_4 =56.36	
r_6 =∞	d_6 =40.5000			
r_7 =∞	d_7 =13.0000	n_5 =1.56883	ν_5 =56.36	
r_8 =∞	d_8 =8.5000			
r_9 =∞	d_9 =12.0000	n_6 =1.56883	ν_6 =56.36	
r_{10} =∞	d_{10} =19.0000			
r_{11} =∞	d_{11} =11.0000	n_7 =1.56883	ν_7 =56.36	
r_{12} =∞	d_{12} =5.8000			
r_{13} =∞（絞り）	d_{13} =7.7000			
r_{14} =16.7708	d_{14} =3.1404	n_8 =1.69680	ν_8 =55.53	
r_{15} =144.6710	d_{15} =4.3618			
r_{16} =79.2665	d_{16} =1.5331	n_9 =1.67270	ν_9 =32.10	
r_{17} =9.0778	d_{17} =3.0000			
r_{18} =12.3898	d_{18} =3.9647	n_{10} =1.58913	ν_{10} =61.14	
r_{19} =-62.1435	d_{19} =4.0000			
r_{20} =∞	d_{20} =21.7300	n_{11} =1.56883	ν_{11} =56.36	
r_{21} =∞	d_{21} =31.5000			
r_{22} =∞（像）				

【００６２】

実施例２

r_1 =48.7360	d_1 =5.0000	n_1 =1.48749	ν_1 =70.23
r_2 =-30.5370	d_2 =2.0000	n_2 =1.83400	ν_2 =37.16
r_3 =-57.0210	d_3 =4.0000		
r_4 =∞	d_4 =20.0000	n_3 =1.56883	ν_3 =56.36
r_5 =∞	d_5 =20.0000	n_4 =1.56883	ν_4 =56.36
r_6 =∞	d_6 =30.5000		
r_7 =∞	d_7 =12.0000	n_5 =1.56883	ν_5 =56.36
r_8 =∞	d_8 =10.0000		
r_9 =∞	d_9 =12.0000	n_6 =1.56883	ν_6 =56.36

り、左右両光学系は、左右のプリズム系の回転による像の回転は一致する。

【００５９】前記の左右撮影光学系のレンズ系は、立体感調整絞り３と共役の位置に開口絞りをおく必要がある。したがって開口絞りの像が撮影系の外に形成されるようにする必要がある。そのため撮影系内部にて１回結像させ、この像を再度結像させるリレーレンズを配置する必要がる。そしてこの２回目の結像点にテレビ撮影系をおき像を撮影するようにすればよい。この第１の結像点と第２の結像点の間に開口絞りを置いて像を撮影系の外部に出して立体感調整絞り３と共役の位置にリレーするものである。

【００６０】上記リレー系の実施例を示す。

【００６１】図６、図７は、このリレー系の左目用の光路の実施例を示すもので、下記データを有する。実施例1

$r_{10}=\infty$	$d_{10}=18.0000$		
$r_{11}=\infty$	$d_{11}=2.5000$	$n_7=1.51633$	$\nu_7=64.14$
$r_{12}=-35.4270$	$d_{12}=3.0000$		
$r_{13}=\infty$	$d_{13}=12.0000$	$n_8=1.56883$	$\nu_8=56.36$
$r_{14}=\infty$	$d_{14}=3.0000$		
$r_{15}=\infty$（絞り）	$d_{15}=14.9936$		
$r_{16}=14.4950$	$d_{16}=3.1000$	$n_9=1.63980$	$\nu_9=34.46$
$r_{17}=30.3850$	$d_{17}=4.0121$		
$r_{18}=-25.5920$	$d_{18}=2.0000$	$n_{10}=1.72825$	$\nu_{10}=28.46$
$r_{19}=10.6910$	$d_{19}=4.5100$		
$r_{20}=31.4850$	$d_{20}=1.4500$	$n_{11}=1.80518$	$\nu_{11}=25.42$
$r_{21}=17.0410$	$d_{21}=3.3800$	$n_{12}=1.81600$	$\nu_{12}=46.62$
$r_{22}=-17.0410$	$d_{22}=11.2749$		
$r_{23}=\infty$	$d_{23}=21.2450$	$n_{13}=1.56883$	$\nu_{13}=56.36$
$r_{24}=\infty$	$d_{24}=33.5830$		
$r_{25}=\infty$（像）			

リレー系の実施例１は、図６に示すもので、３４Ｌは結像レンズ、平面板３５Ｌ，３６Ｌ，３７Ｌ，３８Ｌ，４０Ｌはいずれも図５に示す反射プリズム、４１Ｌはリレーレンズ、４３Ｌは開口絞りである。

【００６３】この実施例１は、結像レンズ３４Ｌによりアフォーカル系７を射出したアフォーカル光束を反射部材３５Ｌ，３６Ｌを通った後に反射部材３７Ｌの内部に結像する。結像後、反射部材３８Ｌ、４０Ｌを透過後、立体感調整絞り３と共役の位置に開口絞り４３Ｌを設け、その後方に反射部材３７Ｌ内に形成された像を再結像するためのリレーレンズ４１Ｌを配置し、このリレーレンズ４１Ｌにより反射部材４２Ｌを透過して撮像面５９Ｌに結像させるように構成されている。

【００６４】右目用の観察系も左目用の観察系と構成は同一であるが、反射部材の配置位置が左目用と若干異なる。すなわち、実施例１では、反射部材３７Ｒは、反射部材３７Ｌより７．５mm物体側にある。また、反射部材３８Ｒは、反射部材３８Ｌより９．５mm像側にある。一方実施例２では、３７Ｒは、３７Ｌより４．５mm物体側にある。また、３８Ｒは、３８Ｌより１３．５mm像側にある。いずれにせよ、右目用の観察光学系と左目用の観察光学系の反射部材の配置は、光路長を変えずに結像性能への影響なく図５のような配置にすることができる。

【００６５】この実施例１は、リレー系を射出する主光線が平行ではないので、モザイクフィルタを使った単板テレビカメラを用いるには問題がないが、３色分解プリズムを使った３板テレビカメラを用いると色シェーディングが発生する。

【００６６】リレー系の実施例２は、図７に示す構成で、アフォーカルズーム系７を射出するアフォーカル光束を結像レンズ３４Ｌにより平行平板（反射部材）３７Ｌと３８Ｌの中間に結像する。この光束は反射部材３８Ｌを通過後リレーレンズ３９Ｌにより反射部材４２Ｌの後方に再結像する。この時、リレーレンズ４１Ｌを射出する光束はテレセントリックになっている。

【００６７】このように、実施例２はリレーレンズ４１Ｌを射出する光束がテレセントリックであることを特徴とし、これによって、干渉膜による色分解プリズムを用いても色シェーディングの発生を抑え得る。つまりリレーレンズ３９Ｌはテレセントリックにしてかつ収差の良好に補正された構成になっている。

【００６８】本発明の実体顕微鏡のように、立体撮影系は、視差による左右の像のずれを除いて倍率がフォーカス位置などの左右の像の差があると観察しにくくなる。そのために左右の光学系は一般に同じものが用いられ、したがって左右の光路長を一致させる必要がある。また、テレビカメラの形状により位置が決められる等の制限のなかで小型化する必要がある。更に本発明の光学系は、全長が長くなりそのために、機械的な移動が少なくてしかも光路長を十分とり得るように光学系のレイアウトをすることが有効である。

【００６９】そのため、二つ以上の反射面を含んでいて入射から射出までの光軸が平面上に位置し、入射と射出の光軸が平行になり光の進行方向が逆向きになる構成にすることが好ましい。

【００７０】図５に示す光学系は、反射部材（反射プリズム）３６Ｌの射出からリレーレンズの入射までの構成と反射部材（反射プリズム）３５Ｒの射出から反射部材３６Ｒへの入射までの光軸までの区間が上記の通りの配置になっている。これにより、反射部材を光軸方向に動かしたとき、移動量の２倍の長さだけ光路長が変わり光路長の調整にとって有効である。

【００７１】又図５に示す構成において、左目用光路は、反射部材３７Ｌと反射部材３８Ｌを平行光軸方向に移動させ、つまり矢印６３、６４方向に移動させ、又、右目用光路は反射部材３６Ｒと反射部材３７Ｒとを移動させ、つまり矢印６５、６６方向に移動させ、この部分

を調整箇所として使用することも有効である。更に、左右の撮影光路で前記平面を直交させるようにすれば立体的突出を小さく抑えることができ望ましい。又、反射部材３５Ｌ、３６Ｌ、３５Ｒ、３６Ｒ等を固定とする場合、３５Ｌと３６Ｌ、３５Ｒと３６Ｒは接合させることが光学系全体の小型化等が可能になり望ましい。尚前記リレー系の実施例はいずれも３５Ｌと３６Ｌおよび３５Ｒと３６Ｒを接合させたものである。

【００７２】この立体撮影系は、左右の目用の入射光軸を含む面が、図１０に示す光分割部材８の入射光軸と反射した光軸とを含む面とが平行であって、かつ光分割部材８の反射部材９の側に撮影系結像レンズ３４Ｒが来るようにすれば主観察側と同じ向きに副観察側の像の向きを合わせることができる。

【００７３】本発明における以上のような構成の立体撮影系は、図１０に示す光学系の光分割部材８の後方に配置することを考えているため撮影系の反射部材による反射は奇数回である。しかし、この撮影系を図１～図４における観察用鏡筒２１位置に取り付けて撮影するとき、撮影系に入射するまでの反射回数が偶数回であるために、像は裏像になり、又立体感調整絞り３と開口絞りの位置が合わなくなり、そのため反射回数を合わせ、開口絞りと立体感調整絞り３とを共役関係を保つために奇数回の反射の反射部材を立体撮影系の結像レンズ３４Ｌ，３４Ｒの前において、鏡筒の代りに取り付けられるようにする必要がある。

【００７４】次に、本発明の実体顕微鏡の第４の実施の形態である複数観察者にテレビ画像を提供するようにした構成の光学系について説明する。

【００７５】前述の３分割により３人の観察者により同時に観察する本発明の光学系を利用してテレビ画像を観察し得るようにした構成の実施の形態について述べる。

【００７６】図８は、前記テレビ画像を観察し得る構成について示すもので、図において、４４Ｌ，４４Ｒは夫々左右の目用の観察用結像レンズ、４５Ｌ，４５Ｒは反射部、４６Ｌ，４７Ｌおよび４６Ｒ，４７Ｒはイメージローテータ、４８Ｌ，４８Ｒおよび４９Ｌ，４９Ｒは反射部材、５０Ｌ，５０Ｒは像挿入部材、５１Ｌ，５１Ｒは接眼レンズ、５２Ｌ，５２Ｒは表示装置、５３Ｌ，５３Ｒは結像レンズである。

【００７７】図８に示す構成の観察用鏡筒は、左目側の光学系において結像レンズ４４Ｌにアフォーカル光束が入射しこのレンズにて結像される。反射部材４５により入射光軸に垂直な方向に反射し、イメージローテータ４６Ｌ，４７Ｌに入射しその内部で５回反射した後入射光軸の延長線上に射出する。ここでイメージローテータ４７Ｌより射出した光束は、反射部材４８Ｌに入射しその内部で３回反射した後入射光軸と平行であって入射方向とは逆方向に射出する。この反射プリズム４８Ｌより射出した光束は反射部材４９Ｌに入射して直角方向に反射され射出する。この反射部材４９Ｌにて反射した後に結像レンズ４４Ｌによる結像点が位置する。この結像レンズ４４Ｌにより形成された像は、接眼レンズ５１Ｌにより左目に拡大観察される。

【００７８】又、右目の側についても全く同様の作用により接眼レンズ５１Ｒを通して右目にて拡大観察される。

【００７９】以上の光学系において、イメージローテータ４６Ｌ，４７Ｌおよび４６Ｒ，４７Ｒにより像は、正立像になるように、イメージローテータをその光軸を回転軸として回転することにより正立像になし得る。

【００８０】図８においては、その構成がわかり易いように記載してあるため、この図の状態のイメージローテータでは正立像にならないが、実際には回転軸のまわりに９０° 回転した配置である。

【００８１】ここで傾斜角を変化させるためにはイメージローテータを回転軸のまわりに角θ回転させることによりイメージローテータ以降の反射部材４８Ｌから接眼レンズ５１Ｌまでを同じ回転軸のまわりに２θ回転させることにより像を回転させることなしに、傾角を可変にすることができる。

【００８２】また、接眼レンズの眼幅調整を行なうためには、反射部材４９Ｌから接眼レンズ５１Ｌまでを、反射部材２９Ｌの入射光軸の方向に移動させることにより行なうことができる。

【００８３】又、同焦が維持されるようにするためには、接眼レンズ５１Ｌも眼幅調整の移動にともない光軸方向に動くようになっている。

【００８４】又、立体撮影系で撮影した画像を表示するために、鏡筒に表示装置５２Ｌ、５２Ｒを設置してこれをリレーレンズ５３Ｌ、５３Ｒにより接眼レンズ５１Ｌ、５１Ｒの像面に合わせるように構成されている。

【００８５】このように像挿入部材５０Ｌにより、撮影系の画像をそのまま接眼レンズ５１Ｌに観察することができる。又表示装置５２Ｌは、液晶モニターのほか反射型液晶ディスプレイでもよい。また像挿入部材５０Ｌは、切り替えて使用する場合切替ミラー又合成する場合はハーフミラーが用いられる。

【００８６】更にテレビ撮像系は、主観察側に設ける場合は、反射部材８の後方に配置し、又副観察側に設ける場合は、３人観察のうちの左右で使わない方の副観察側に取り付けるようにすればよい。この副観察側のうちの撮影系を取り付けた副撮影系は、他の副観察側の副観察系に像の向きを合わせるようにすることが望ましい。そのために、この副撮影系の前に取り付ける奇数回反射の反射部材は、反射部材内部の光軸により形成される面（光軸を含む面）が、副撮影系の左右の光軸を含む面と平行になるようにすればよい。更に、副撮影系の右目用射出光路に副撮影系の左目撮影系を合わせればよい。これにより副観察側で撮影画像に切り替えても同じ向きの

像を得ることができる。この撮影画像は、実際の観察像と開口位置の差による視差が発生するが、その差は僅かであり実用上問題はない。

【００８７】又主観察側は、鏡筒を鏡筒入射のリレー系の第２レンズ１４の射出光軸の延長上の軸を回転軸にして回転し、この回転と連動させて主観察側用撮影光学系をアフォーカルズーム系７の光軸を回転軸として回転させ、また副観察側は、３分割プリズムを左右の副観察側を一体にしてリレー系の第２レンズ１４射出の光軸を回転軸として回転させることにより副撮影系と副観察系の像の関係を維持し得る。また、反射部材２８の入射光軸を回転軸として回転させる場合、副観察系と副撮影系との像の向きの差がでないように左右連動して動くことができる。

【００８８】またイメージローテータ２９による鏡筒の回転は、物体側の光軸は動かないため連動機構は必要ない。したがって、イメージローテータ２９に立体撮影系を取り付ける場合、イメージローテータ２９や撮像装置は固定させることが望ましい。

【００８９】上記のような構成にすることにより左右の立体撮影系と画像挿入装置を取り付けても観察者のアイポイントが高くなることはなく、主観察者と副観察者の二人の観察者が共に良好な立体感でのテレビ観察像を得ることができる。

【００９０】本発明の実体顕微鏡において、特許請求の範囲に記載する構成のほか、次の各項に記載する実体顕微鏡も発明の目的を達成し得る。

【００９１】（１）特許請求の範囲の請求項２に記載する実体顕微鏡で、前記鏡筒光学系の観察方向の変更に合わせて前記立体撮像系の撮像方向が変化するようにしたことを特徴とする実体顕微鏡。

【００９２】（２）前記の（１）の項に記載する実体顕微鏡で、前記変倍系がアフォーカル変倍系とリレー系よりなり、少なくとも一つの立体撮影系がアフォーカル変倍系と１回結像リレー系の間に配置された光分割部材により分割された光束中に配置されたことを特徴とする実体顕微鏡。

【００９３】（３）前記の（２）の項に記載する実体顕微鏡で、前記１回結像リレー系を射出後の光束に他の撮像系を備えた撮像装置を設け、該撮像装置と前記光分割部材により分割された光束中の撮像系を備えた撮像装置とが共通である実体顕微鏡。

【００９４】（４）特許請求の範囲の請求項１に記載する実体顕微鏡で、前記光分割部材の光分割面又は光分割面を延長した面が交差する位置が前記変倍光学系の光軸と一致するようにしたことを特徴とする実体顕微鏡。

【００９５】（５）前記の（４）の項に記載する実体顕微鏡で、前記光分割部材の光分割面で反射された複数の反射光束がそれぞれ左右の目の観察用の開口絞りによって決まる光軸を共通に使用するイメージローテーターを有していることを特徴とする実体顕微鏡。

【００９６】（６）特許請求の範囲の請求項３に記載する実体顕微鏡で、前記第１の光路と前記第２の光路がいずれも結像光学系を有し、前記両結像光学系が同じレンズにて構成され、前記立体撮像系中に像の向きおよび倍率を一致させるための反射部材を備えたことを特徴する実体顕微鏡。

【００９７】（７）前記の（６）の項に記載する実体顕微鏡で、立体撮像系内部の結像点と像面との間にある開口と像点との間にレンズを配置して撮影系がテレセントリックであるようにした実体顕微鏡。

【００９８】（８）前記の（７）の項に記載する実体顕微鏡で、立体撮像系の反射回数が奇数回と偶数回とに切り替え得るようにしたことを特徴とする実体顕微鏡。

【００９９】（９）特許請求の範囲の請求項３に記載する実体顕微鏡で、前記第１の光路と前記第２の光路がそれぞれ少なくとも二つの反射面を有し、前記反射面の一つに入射する第１の光軸と、前記反射面から出射する第２の光軸とが平行になるようにしたことを特徴とする実体顕微鏡。

【０１００】（１０）前記の（９）の項に記載する実体顕微鏡で、前記第１の光路における前記第１の光軸と前記第２の光軸とを含む第１の平面と、前記第２の光路における前記第１の光軸と第２の光軸を含む第２の平面とが互いに交差するようにしたことを特徴とする実体顕微鏡。

【０１０１】（１１）前記の（１０）の項に記載する実体顕微鏡で、前記第１の平面と前記第２の平面とが直交するようにしたことを特徴とする実体顕微鏡。

【０１０２】（１２）特許請求の範囲の請求項２に記載する実体顕微鏡で、前記変倍光学系からの光束を透過と反射とに分割する光分割面を有する光分割部材を複数有し、前記鏡筒光学系が前記光分割部材のうちの一つに接続され、前記立体撮像系が他の光分割部材に接続されていることを特徴とする実体顕微鏡。

【０１０３】

【発明の効果】本発明の実体顕微鏡によれば、複数の観察者により同一の視野で同一の倍率の立体像を夫々見やすい位置で観察でき、しかも各観察者のアイポイントが、物体に近い位置に来るようにし得る。又本発明によれば小型で像の左右差の少ない観察を行なうことが可能で、鏡筒の代りに取り付けることも可能な立体撮影装置を備えた実体顕微鏡を実現し得る。又、この撮像装置を備えた実体顕微鏡もアイポイントを物体に近づけることが可能であり、複数の観察者により観察像とかわらないテレビ画像での観察が可能である。

【図面の簡単な説明】

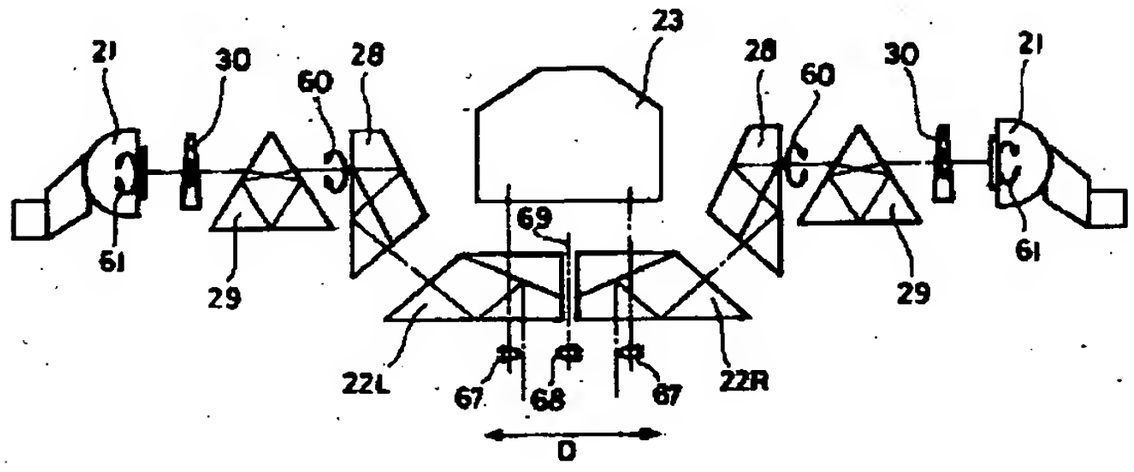
【図１】　本発明の実体顕微鏡の第１の実施の形態の副観察側の構成を示す図

【図２】　本発明の実体顕微鏡の第１の実施の形態の主

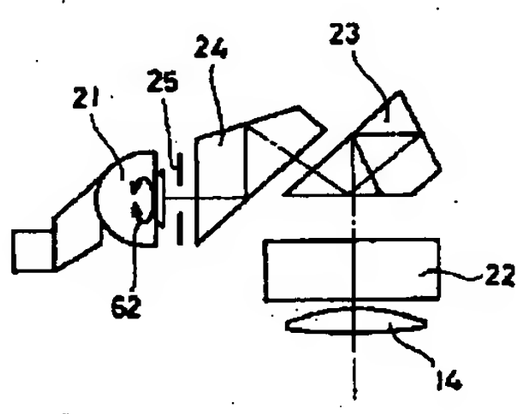
観察側の構成を示す図
【図３】　本発明の実体顕微鏡の第２の実施の形態の主観察側の構成を示す図
【図４】　本発明の実体顕微鏡の第２の実施の形態の副観察側の構成を示す図
【図５】　本発明の実体顕微鏡に用いる撮像系の構成を示す図
【図６】　前記撮像系で用いるリレー系の実施例１の断面図
【図７】　前記撮像系で用いるリレー系の実施例２の断面図
【図８】　テレビ画像での観察を可能にした光学系の構成を示す図
【図９】　３人観察用の分割部の開口の位置関係を示す図
【図１０】従来の実体顕微鏡の対物レンズからリレー系までの構成を示す図
【図１１】従来の実体顕微鏡の２人観察用の分割部の構成を示す図
【符号の説明】

２１	鏡筒
２２Ｌ、２２Ｒ	光分割部材
２３、２８	ダハプリズム
２５	開口絞り
２９	イメージローテータ

【図１】



【図２】



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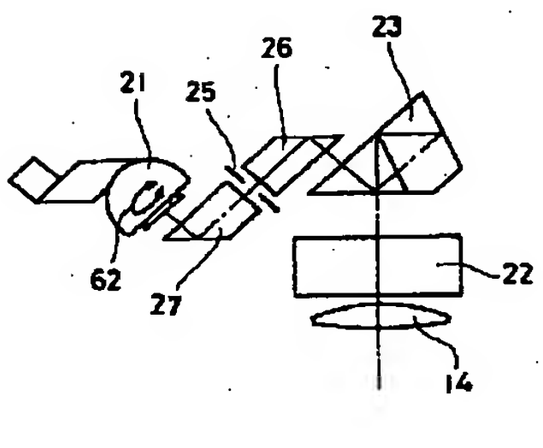

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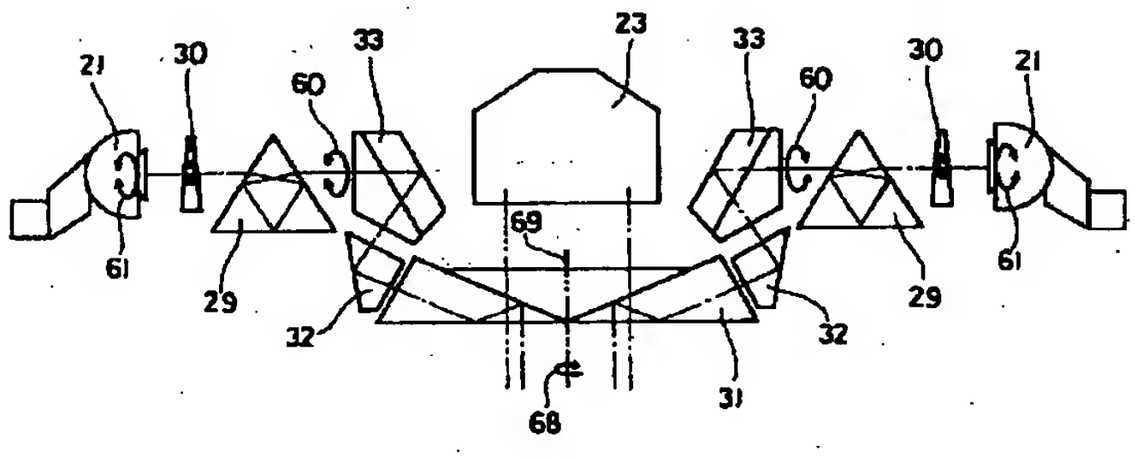

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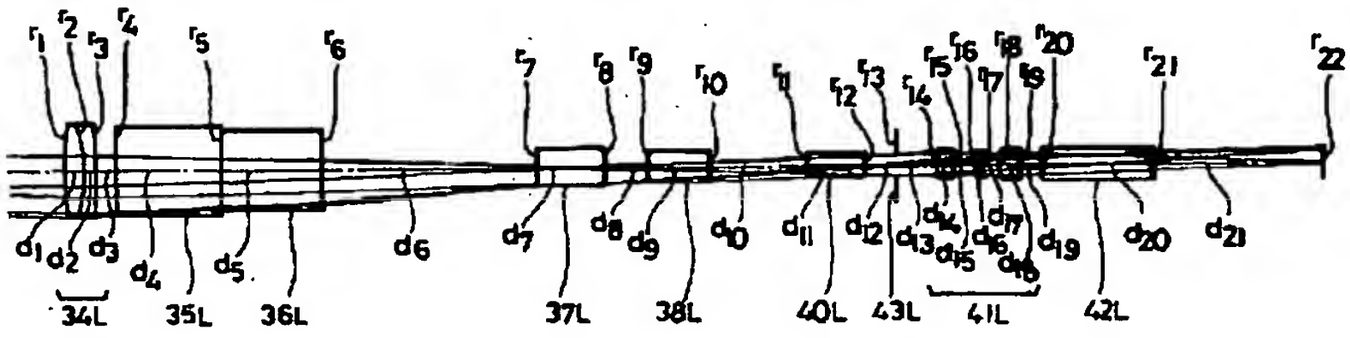

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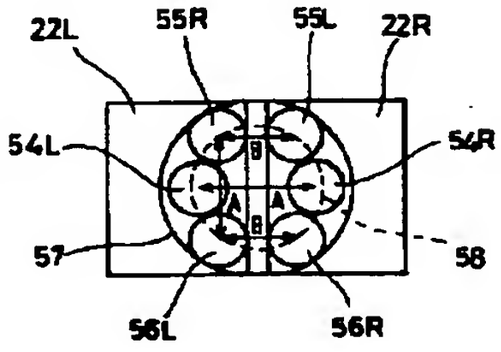

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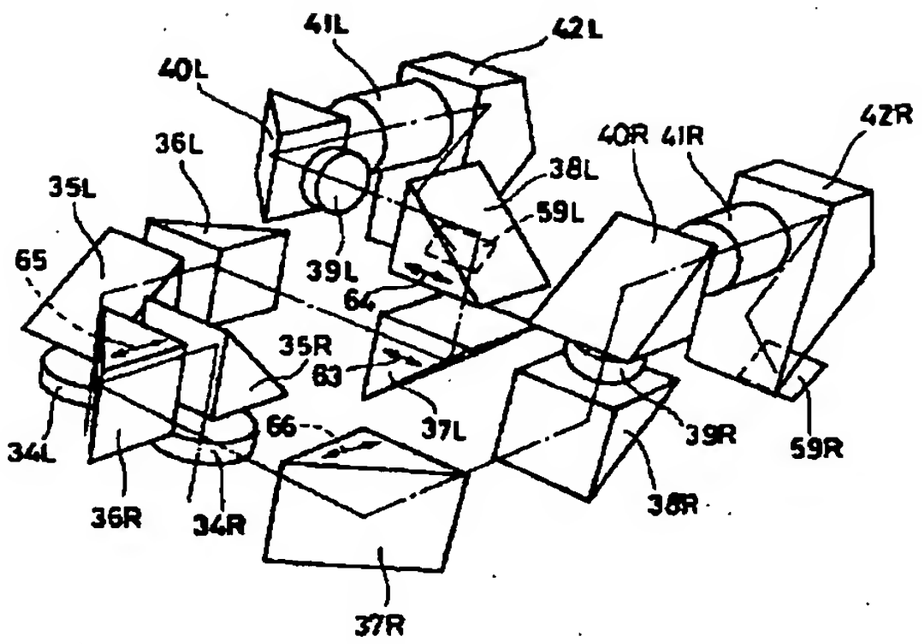

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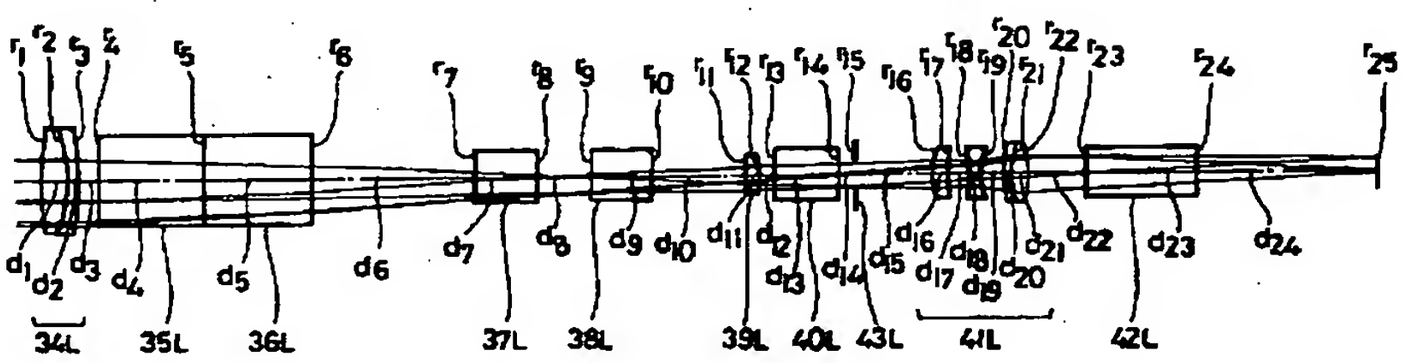

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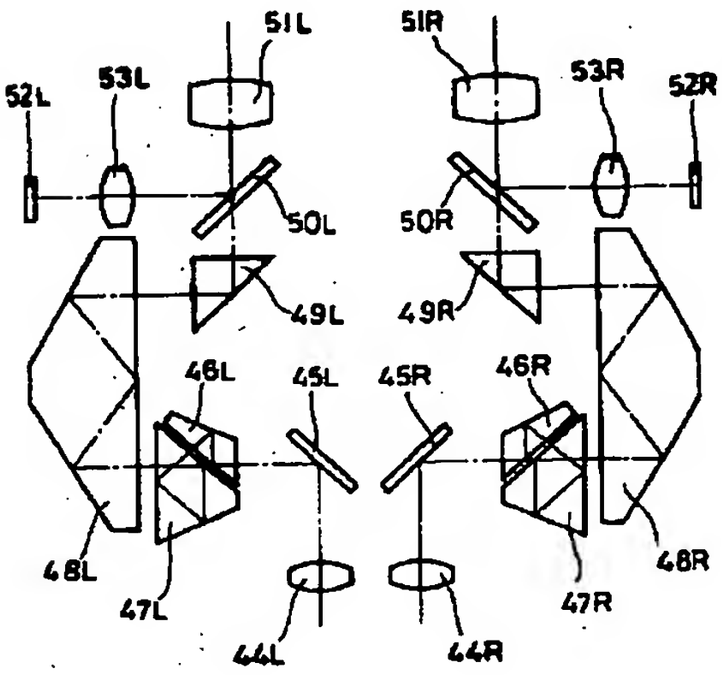
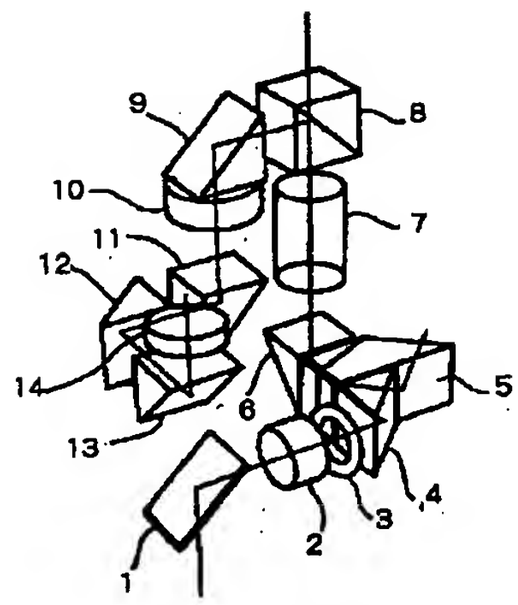
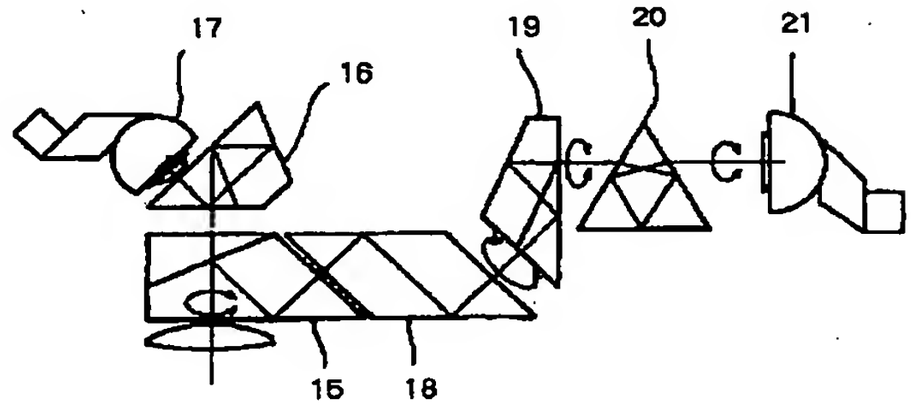


【図１０】



【図１１】



MACHINE TRANSLATION OBTAINED FROM THE JAPANESE PATENT OFFICE WEBSITE
JP 11258516 A

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CLAIMS

[Claim(s)]

[Claim 1] the reflective member characterized by providing the following -- having -- the aforementioned reflection -- the field which extended the optical parting plane or the optical parting plane of the one reflective section in a member, and other reflection -- the stereoscopic microscope characterized by there being a field where the field which extended the optical parting plane or the optical parting plane of a member crosses inside the flux of light from the aforementioned variable power optical system Objective lens system Variable power optical system It is the optical parting plane which divides the flux of light from the aforementioned variable-power optical system into transparency and reflection in the stereoscopic microscope passing through the place where the right-and-left observation optical axis which it consists of lens-barrel optical system, and the optical axis of the aforementioned objective lens system and variable power optical system is in agreement, and it has at least one image formation point, and the aforementioned lens-barrel optical system consists of the aperture diaphragm, image formation lens, and ocular of a right-and-left couple, and is determined by the aperture diaphragm of the aforementioned right and left, respectively differs from the optical axis of variable-power optical system.

[Claim 2] It consists of an objective lens system, variable power optical system, and lens-barrel optical system, and the optical axis of variable power optical system [the aforementioned objective lens system and] corresponds, and it has at least one image formation point. the aforementioned lens-barrel optical system In the stereoscopic microscope passing through the place where the observation optical axis of the right and left which consist of the aperture diaphragm, image formation lens, and ocular of a right-and-left couple, and are determined by the aperture diaphragm of the aforementioned couple, respectively differs from the optical axis of the aforementioned variable power optical system The stereoscopic microscope characterized by equipping the aforementioned stereoscopic microscope with a solid image pck-up system, and the stereogram image by this solid image pck-up system being equivalent to the observation image by the aforementioned lens-barrel optical system.

[Claim 3] The stereoscopic microscope characterized by having the solid image pck-up system characterized by providing the following, having the image formation optical system with which the aforementioned solid image pck-up system carries out image formation of the flux of light once, and the aperture diaphragm of the aforementioned solid optical system being mostly in agreement with the aperture diaphragm of the aforementioned lens-barrel optical system Objective lens system Variable power optical system It is the optical path of the couple which it consists of lens-barrel optical system, and the optical axis of the aforementioned objective lens system and variable-power optical system is in agreement, and it has at least one image-formation point, the aforementioned lens-barrel optical system becomes from the aperture diaphragm, the image-formation lens, and the ocular of a right-and-left couple, and the aforementioned stereoscopic microscope becomes from the 1st optical path and 2nd optical path in the stereoscopic microscope passing through the place where the right-and-left observation optical axis determined by the aperture diaphragm of the aforementioned right and left, respectively differs from the optical axis of variable power optical system.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001] [The technical field to which invention belongs] this invention has the aperture diaphragm of the right-and-left couple divided into the flux of light for the eye of right and left behind the common optical system containing variable power optical system, and relates to the stereoscopic microscope which performs solid observation by the eye of right and left of the flux of light on either side.

[0002] [Description of the Prior Art] Since it can carry out expansion observation of the body and can moreover acquire three-dimensional information, in case a stereoscopic microscope does the work to a body, it is especially effective and using as an operation microscope is effective.

[0003] About such a stereoscopic microscope, an operation microscope is described as an example.

[0004] In order that an operation microscope may enable a more difficult operation, to be the composition that two or more observers can observe an image from a free simultaneous and direction is desired.

[0005] In order to accept this demand, the operation microscope indicated by JP,4-156412,A is known considering the flux of light which forms each image seen by the eye on either side as an example of the operation microscope which let one variable power optical system pass. By rotating the aperture diaphragm for right-and-left optical paths prepared behind variable power optical system around the optical axis of variable power optical system, this conventional example can change the observation direction freely, and is the thing of the composition in which observation by two or more observers is possible.

[0006] Moreover, the stereoscopic microscope indicated by JP,9-318882,A is known as other conventional examples. the back of the variable power optical system of the above-mentioned [this conventional example] -- relay system arrangement -- carrying out -- aberration -- good -- an amendment -- it is made like Therefore, the flux of light is bent and it is made to lower an eye point to a body side by preparing a reflective member for the optical path length which became long. Moreover, in order to lessen change of a cubic effect accompanying variable power, it is made to set drawing in opening and a conjugate position.

[0007] Drawing 10 is drawing showing an example of the stereoscopic microscope which enabled observation from a free direction. drawing -- setting -- 1 -- a one-way mirror and 2 -- an objective lens and 3 -- cubic-effect adjustment drawing, and 4, 5 and 6 -- respectively -- as for the 1st lens of a relay system, and 11, 12 and 13, for an optical division member and 9, a reflective member and 10 are [a reflective member and 7 / an afocal zoom system and 8 / a reflective member and 14] the 2nd lens of a relay system

[0008] In such a conventional stereoscopic microscope, the lighting system for illuminating on the observation shaft and the same axle of an observation body is prepared in the opposite side (it sets to drawing and is the upper part of a one-way mirror 1) with the body side of a one-way mirror 1. It is reflected by the one-way mirror 1 and the flux of light from the body illuminated by this lighting system turns into the afocal flux of light through an objective lens 2. in order that this afocal flux of light may suppress change of a cubic effect accompanying variable power, pass with the drawing 3 for cubic-effect adjustment -- reflection -- it is reflected by members 4 and 6 and goes to the drawing upper part reflection -- after passing along the afocal zoom system 7 of an objective lens 2 and the same axle arranged behind the member 6 -- optical division -- it is divided by the member 8 That is, the flux of light which injected the afocal zoom system 7 It is reflected by the member 9 and a drawing is turned caudad. optical division -- it reflects by the member 8 -- having -- reflection -- the reflection after forming a body image with the 1st lens 10 of the relay system to which image formation of the afocal flux of light is carried out after that -- it is reflected by members 11, 12, and 13, respectively, the extension wire top of the incident-light shaft (incident-light shaft to a one-way mirror 1) from a body is turned to the drawing upper

part, and it is parallel mostly at an incident-light shaft Even when this uses the long optical system of the optical path length, a body position and the position of an observer's eyes can be brought close, an eye point position can be lowered, and it makes it possible to treat on a par with an ordinary stereoscopic microscope. In this optical system, if a lens is arranged near the image formation point of a relay system, it will be easy to perform adjustment of a pupil position.

[0009] Next, a part for the intermediate-head cylinder part which divides the flux of light is stated to two-person observation based on drawing 11 as a conventional example for the intermediate-head cylinder part which performs observation by two or more observers like the stereoscopic microscope of this invention.

[0010] In drawing 11 , the beam splitter which divides 15 into a main observation and subobservation side, the roof prism with which 16 was prepared in the main observation side, and 17 are the lens-barrels by the side of the main observation. Moreover, as for the prism of a parallelogram, and 19, 3 times, an image rotator and 21 are subobservation side lens-barrels, and a reflective roof prism and 20 constitute [18] the optical system by the side of subobservation by these.

[0011] The flux of light which carries out incidence to a beam splitter 15 among the flux of lights after injecting an image formation relay system once, and penetrates this beam splitter in a part for the intermediate-head cylinder part shown in this drawing 11 is the other side to the main observation side. That is, after the flux of light which penetrated the beam splitter 15 is made into an erect image by the erect roof prism 16, incidence of it is carried out to the main observation side lens-barrel 17, and it is observed by the main observer.

[0012] Moreover, after the flux of light reflected by the beam splitter 15 is the other thing in a subobservation side, carries out incidence to the prism 18 of a parallelogram, becomes an erect image through the roof prism 19 after injection about this and passes along the image rotator 20, incidence of it is carried out to the secondary mirror cylinder 21, and it is observed by the vice-observer.

[0013] The prism of a parallelogram is used in order that the intermediate-head cylinder by the side of the subobservation as above may detach only a suitable distance the main observation side. By making rotation possible by setting the axis of rotation as the optical axis of a relay system, making rotation possible by setting the axis of rotation as the optical axis between the parallelogram-like prism 16 and a roof prism 19, rotating back optical system and rotating a subobservation side lens-barrel at an angle of the double precision of this rotation simultaneously with this from a roof prism 19 The direction at which it looks in without a rotation of image is changeable. Moreover, opening is in the position shifted from the lens-barrels 19 and 21 by the side of the main observation and subobservation, and has installed opening before the image rotator 20 in consideration of the miniaturization of an image rotator so that the optical path length may be mostly in agreement the main observation side.

[0014] If this intermediate-head cylinder is used, it is simultaneously observable with two observers. Moreover, by carrying out several step parallel bank arrangement of the division section, the simultaneous observation by three or more observers is also attained.

[0015] If the stereoscopic microscope using this intermediate-head cylinder is used for an operation, two or more operators' participation is possible. However, the distance of an operator and the way section has the shorter desirable one. Moreover, if there are three operators, a more advanced operation is attained and near and a bright microscope of an image are desired for a body and an eye by all three persons.

[0016] However, it cannot be said that it is fully satisfied [with this conventional example] of these demands.

[0017] Moreover, when information effective in an operation is acquired from the light which is not visible, or a feeble light, for example, it observes by infrared radiation, the skin may become transparent, and the position of a blood vessel may become clear, and a cancer cell may emit characteristic fluorescence by fluorescence observation. In order to observe these, a television picture is effective, and a television picture can emphasize few differences by profile emphasis or color emphasis, and becomes easy to judge them. As for these television picture, it is desirable that it can check providing for two or more operators in the state where solid observation can be carried out, and working at the time of an operation. And it is arranged so that a television photography position may not become obstructive [work], and a small thing is desirable.

[0018] [Problem(s) to be Solved by the Invention] The 1st purpose of this invention is the stereoscopic microscope which observes by many observers, and is to offer the stereoscopic microscope by which it was made for an eye point to come to the position near an operation side.

[0019] The 2nd purpose of this invention is to offer the stereoscopic microscope which can perform the solid image pck-up doubled in an observer's observation direction.
[0020] The 3rd purpose of this invention is to offer the stereoscopic microscope which enabled much the observation and the solid image pck-ups by the observer, and was used as small image pck-up equipment.
[0021] [Means for Solving the Problem] The stereoscopic microscope of this invention consists of an objective lens system, variable power optical system, and lens-barrel optical system. The optical axis of the aforementioned objective lens system and variable power optical system is in agreement, and it has at least one image formation point. the aforementioned lens-barrel optical system The place where the right-and-left observation optical axis which consists of the aperture diaphragm, image formation lens, and ocular of a right-and-left couple, and is determined by the aperture diaphragm of the aforementioned right and left, respectively differs from the optical axis of variable power optical system A passage, It has the reflective member which has the optical parting plane which divides the flux of light from variable power optical system into transparency and reflection. the aforementioned reflection -- the field which extended the optical parting plane or the optical parting plane of the one reflective section in a member, and other reflection -- it is characterized by there being a field where the field which extended the optical parting plane or the optical parting plane of a member crosses inside the flux of light from the aforementioned variable power optical system
[0022] That is, this invention serves as further an objective lens system and variable power optical system as shown in drawing 10 from lens-barrel optical system, and the optical axis of object optical system and variable power optical system is in agreement, and it has at least one image formation point, lens-barrel optical system consists of the aperture diaphragm, image formation lens, and ocular of a right-and-left couple, and it makes it possible to observe simultaneously by many observers.
[0023] Therefore, the stereoscopic microscope of this invention carries out the flux of light after the aforementioned afocal relay system injection of the thing of composition of becoming the objective lens 2 and it which show aforementioned drawing 10 , and the afocal variable power system 7 installed in the same axle from the image formation afocal relay systems 10-14 once from a center for 2 minutes using drawing 1 and the trichotomy prism 22 as shown in 2, and trichotomizes it into leftward transparency and reflection, and rightward transparency and reflection. And it is characterized by making it the nodal line of the field reflected leftward and the field reflected rightward cross the injection optical axis of the afocal relay system of image formation once. The eye point of the main observer who is the side which can miniaturize division prism and penetrates division prism by this can be prevented from separating from a body, and reduction of the luminosity of the whole image can be lessened. Moreover, the same effect will be acquired if it is made for the boundary of each parting plane to be located in the flux of light of the width of face D of drawing 1 in the flux of light injected from the 2nd lens (lens 14 in drawing 2) of a relay system when division by division prism is increased and observation by further many observers is enabled.
[0024] Moreover, other composition of the stereoscopic microscope of this invention consists of an objective lens, variable power optical system, lens-barrel optical system, etc. as above-mentioned, prepares a solid image pck-up system further, and is characterized by making it equivalent [the stereogram image by this solid image pck-up system] to the observation image by lens-barrel optical system.
[0025] Therefore, two or more lens-barrel optical system is formed, and it enabled it to observe the stereoscopic model picturized by the observation optical system by being made to perform the solid image pck-up corresponding to each. That is, in front of stereoscopic-television optical system, it considers as the composition which prepared the reflective member which doubles the number of times of reflection, and the position of a pupil, and this is used, installing it instead of one lens-barrel of the right and left by the side of subobservation. In this case, it is desirable to make it interlock so that an observation position may not change the lens-barrel which installed stereoscopic-television optical system, and other lens-barrels. moreover, the optical division which shows a television photography system to drawing 10 -- it arranges to the transparency side of a member 8, this and the main observation side lens-barrel interlock, and you may make it move Thus, even if all by the side of the main observation and subobservation change a television image and an observation image, there can be no difference in an observation position.
[0026] Thus, by constituting, it is dark and work [be / no work top sense of incongruity] with it is possible by changing the image formed with the light which is not visible with the naked eye, the image which is hard to

check, the image emphasized by the image processing to an observation image, and observing it, or piling it up. / there is little between **** and efficient

[0027] Next, the stereoscopic microscope as above-mentioned is equipped with the solid image pck-up equipment which has the optical path of the couple which consists of the 1st optical path and 2nd optical path with other composition of the stereoscopic microscope of this invention, this solid image pck-up equipment has the image formation optical system which carries out image formation of the flux of light once, and it is characterized by making it mostly in agreement [the aperture diaphragm of solid image pck-up equipment] with the aperture diaphragm of lens-barrel optical system.

[0028] namely, -- for example, the optical division in the optical system of composition of being shown in drawing 10 -- it is what attached the television photography system in either the transparency side of a member 8, or of the subobservation side lens-barrels 21 of the right and left shown in drawing 1 , and it is necessary to make it make in agreement the pupil by the side of observation, and the aperture diaphragm of a photography system Therefore, in this invention, image formation is carried out once inside a photography system, an aperture diaphragm is prepared, and the conjugate position of an aperture diaphragm was established in the body side. In order to double the optical path length on either side in that case, it was made composition as shown in drawing 5 . That is, the optical path length was adjusted, and as the optical path length was prolonged in the double precision of this movement magnitude, it enabled it to adjust the optical path length without a major change to it by moving the reflective member by which the portion to which the optical axis of both optical paths becomes parallel was prepared in order to adjust the optical path length, and this optical axis was prepared in the parallel section. the composition which shows this portion to drawing 5 -- reflection of the optical path for left eyes -- a member -- the reflection from the incident-light shaft of 37L -- a member -- up to the injection optical axis of 38L -- it is -- moreover, reflection of the optical path for right eyes -- a member -- the reflection from the incident-light shaft of 36R -- a member -- it is a portion to the injection optical axis of 37R Thereby, while it has been small, adjustment becomes possible. Furthermore, if this composition is adopted as both optical system on either side, since the flat surface decided by the parallel optical axis intersects perpendicularly, arrangement to small capacity is attained.

[0029] [Embodiments of the Invention] Next, the form of operation of the 1st of the stereoscopic microscope of this invention is described.

[0030] The form of operation of the 1st of this invention is the thing of composition of dividing the flux of light which injects variable power optical system, enabling observation by two or more observers, and making it possible for an optical division member to divide into plurality the flux of light injected from the 2nd lens 14 of the relay system of the optical system (optical system containing an objective lens, variable power optical system, etc.) shown in drawing 10 , and to observe by many observers.

[0031] Drawing 1 and drawing 2 show the division system which divides into a main observation and two subobservation side the light which injects variable power optical system with the form of operation of the 1st of the stereoscopic microscope of this invention, and these drawing 1 and 2 are division systems which trichotomize the flux of light as an example.

[0032] Drawing 1 shows a subobservation side, it is an optical division member (optical division prism) for 14 dividing 22L and the 2nd lens of a relay system and 22R dividing the flux of light from the 2nd lens 14, respectively, and reflection on either side divides in the three directions of a two subobservation side a transparency, i.e., main observation, side (drawing 2) by this division member. It is constituted so that the line (nodal line) by which the reflector of this optical division prism 22L and 22R crosses, and the injection optical axis of the 2nd lens 14 of a relay system may cross. It enables this to divide light into a subobservation side on either side equally. As shown in drawing 2 , incidence of the flux of light by the side of the main observation which penetrates this optical division prism 22 is carried out to the main observation side roof prism 23, and the lens-barrel rotated 180 degrees with this roof prism 23 is attached. A lens-barrel has an image formation lens, erection optical system, and an interpupillary-distance adjustment mechanism, and a tilt angle is adjustable. The aperture diaphragm 25 is arranged in this state in the conjugate position at the time of the highest scale factor of solid observation adjustment drawing and an afocal zoom system, and when it is the highest scale factor, it is made to stop that a cubic effect becomes large.

[0033] The subobservation side of the right and left reflected by the optical division prism 22L and 22R is

symmetrically arranged to the field containing the injection optical axis of the 2nd lens 14 of a relay system.
[0034] Next, the subobservation side of the gestalt of this 1st operation is described still in detail. the Yusuke observation side -- the 2nd lens 14 of a relay system -- optical division -- a member -- after the flux of light which carried out incidence was reflected in 22R in respect of the one-way mirror of the interior -- further -- it reflects inside 1 time -- having -- optical division -- a member -- it is injected in the direction to which 45 degrees inclined to the incident-light shaft of 22R this optical division -- a member -- the crepuscular-rays division which carried out incidence of the flux of light which injected 22R to the subobservation side roof prism 28, and was reflected by the reflector and the Dach surface a total of 3 times inside -- a member -- it is got blocked in the perpendicular direction to the incident-light shaft of 22R, and is injected in the direction of the level surface Then, the wedge prism 30 is arranged and, thereby, movement of **** is lessened. That is, the shortage of a process tolerance of the image rotator prism 29 is compensated with this wedge prism 30, and image rotator prism can be made cheaply. The subobservation side lens-barrel 21 is formed in the this wedge prism's 30 injection side.
[0035] Although this secondary observation side lens-barrel 21 does not have the aperture diaphragm unlike the main observation side lens-barrel, it is the same as the main observation side lens-barrel except it. An aperture diaphragm is prepared in a conjugate position in case the afocal zoom system 7 of the cubic-effect adjustment drawing 3 shown in drawing 10 is the highest scale factor, and is located between the wedge prism 30 and the subobservation side lens-barrel 21 with the optical system of the gestalt of this operation. In addition, a **** observation side is as symmetrical as the Yusuke observation side, and the operation is the same.
[0036] moreover, the optical axis (observation optical axis) decided by the aperture diaphragm and the image surface of a lens-barrel -- optical division -- a member -- from the main observation photometry shaft of 22R, it is alike, is set up, and is as being shown in drawing 9 Drawing 9 is drawing which looked at the optical division prism 22L and 22R from the 2nd lens 14 side of a relay system, and shows the openings 55L and 55R for the eyes of right and left by the side of opening 54for left eyes L by the side of the main observation, opening 54for right eyes R, and **** observation, and the openings 56L and 56R for the eyes by the side of right-and-left observation. Moreover, the injection flux of light 57 of the 2nd lens 14 of a relay system is narrowed by cubic-effect adjustment drawing, and turns into the injection flux of light 58 for the highest scale factor as a scale factor goes up. thus, the thing to arrange -- optical division -- the flux of light is narrowed by Members 22L and 22R, and dimming of the visual field circumference and the eclipse of an image can be lessened
[0037] When setting the optical-axis interval of a lens-barrel to A here as shown in drawing 9 , and setting distance of the field containing the right-and-left observation optical axis by the side of subobservation on either side to B, if the following conditions are satisfied, there is little dimming of the visual field circumference.
[0038] If a visual field is narrowed by lengthening the focal distance of an image formation lens, or carrying out gathering a magnification of ocular even when dimming of the visual field circumference arises somewhat etc., and gathering the scale factor of lens-barrel optical system around 0.6 <=B/A<=0.8 visual field, dimming of the visual field circumference can be lost.
[0039] Moreover, the optical system by the side of subobservation may have comes to rotate, as make the image rotator prism 29 and the wedge prism 30 into one, the axis of rotation is set as the middle shaft of two observation opticals axis, the object for left eyes, and the object for right eyes, and it can rotate now, that is, it is shown in 60 of drawing 1 , and it constitutes the 1st rotation section. Moreover, as the subobservation side lens-barrel 21 containing an aperture diaphragm is also shown in a sign 60 by setting the axis of rotation as the center of an observation optical axis on either side and it can rotate, the 2nd rotation section is constituted.
[0040] A lens-barrel can be rotated without a rotation of image if the angle of rotation alpha 1 of the 1st aforementioned rotation section and the angle of rotation alpha 2 of the 2nd rotation section are rotated by the following relation.
[0041] alpha1:alpha2=1:2 -- this is effective as image amendment of a vice-observer when the observer by the side of the main observation leans a mirror body forward and backward
[0042] moreover, optical division -- a member -- some observation directions are changeable by making the axis of rotation rotate the middle of the observation optical axis of right and left between 22R and the subobservation side roof prism 28, as from the subobservation side roof prism 28 to the secondary mirror cylinder 21 shown in 67 of drawing 1 In this case, although the boundary of a reflector does not come on the injection optical axis of

the 2nd lens 14 of a relay system, the boundary of this reflector is included in the reflector within the injection flux of light. the same -- optical division -- a member -- the middle shaft of the right-and-left observation optical axis by the side of the incidence of 22R -- the axis of rotation -- optical division -- some observation directions are changeable by making from member 22R to the lens-barrel 21 for subobservation into one, and rotating it somewhat

[0043] Moreover, three persons' observation position is changeable by making it rotate, as a subobservation side on either side is made into one and it is shown in 68 of drawing 1 by setting the axis of rotation as the injection optical axis of the 2nd lens 14 of a relay system. It is more desirable to interlock with [movement / by the side of subobservation] the main observation side at this time, and not to move.

[0044] Next, the thing of the three-person observation section (trichotomy) as the example is described about the main observation side in the gestalt of operation of the 1st of the stereoscopic microscope of this invention.

[0045] The main observation section of the gestalt of this 1st operation is composition as shown in drawing 2 , and is the example it was made for the eye point of an ocular not to separate from on extension of the incident-light shaft to a one-way mirror 1 in the direction (for it to be henceforth called the shift direction) perpendicular to the optical axis of the one-way mirror 1 shown in drawing 10 . That is, it is the example it was made for an observer's eyes not to separate from the incident-light shaft to a one-way mirror 1. Although you may separate from the aforementioned incident-light shaft, in order to do the various work to a body while the direction near an observer's eyes observes the incident-light shaft orientations of a one-way mirror 2, a request of an observer that it is desirable depends the eye point of an ocular on a strong thing. This 1st example is made the composition in alignment with this request. That is, although the roof prism 23 by the side of the main observation is the same as the roof prism by the side of the subobservation shown in drawing 1 , it is made to reflect it in the shift direction through the reflecting prism 24 of 2 times reflection of the flux of light injected from this roof prism 23 by the main observation side. After injecting this reflecting prism 24, the aperture diaphragm 25 is installed. This is installed in the position relayed for the highest scale factor of the afocal zoom system of cubic-effect adjustment drawing. The main observation side lens-barrel 21 without an aperture diaphragm is attached in the interior at the image side of this aperture diaphragm 25.

[0046] By making it the above composition, an eye point approaches incident-light shaft orientations, and the gestalt of the 1st operation of this main observation side becomes the position distant in the shift direction.

[0047] Moreover, set the axis of rotation as the middle shaft of the aperture diaphragm 25 on either side, observation with sense with an arbitrary main observer is attained by making drawing 2 rotate the main observation side lens-barrel 21, as a sign 62 shows, and observation with an easy posture is possible.

[0048] moreover -- since the flux of light for subobservation of the right and left by the side of subobservation of the gestalt of the 1st operation of the above-mentioned passes along another field by the optical division member (22L, 22R) -- the heart and this ** -- setting -- a difference -- being generated -- this -- an amendment sake -- the reflection by the side of the main observation -- what is necessary is to insert an afocal variable power lens between a member 24 and a lens-barrel 21, and just to carry out adjustment of the heart and this ** with this In addition, also in the gestalt of the 2nd operation shown later, it is the same.

[0049] Drawing 3 and drawing 4 are drawings showing the composition by the side of the main observation of the form of operation of the 2nd of this invention, and subobservation.

[0050] Drawing 3 is drawing having shown the optical system by the side of the main observation for the object for three-person observation in the form of the 2nd operation as an example. the optical division which shows this optical system to drawing 4 -- the reflector for 2 times reflection of the outgoing beam after being divided by the member 31 and reflected is arranged in parallel mutually That is, two reflective members (reflecting prism) 26 and 27 have been arranged after flux of light outgoing radiation, and these reflecting prisms have been arranged so that the reflector may become parallel mutually. By this, while it has been parallel to the optical axis of the light which carried out outgoing radiation of the roof prism 23, adjustment of an eye point position is attained. Moreover, it enabled it to install an aperture diaphragm 25 by constituting reflective prism from two prism 26 and 27 twice between cubic-effect adjustment drawing and both the prism that is the positions of almost conjugate. Moreover, adjustment of the heart or this ** was enabled by arranging the main observation side lens-barrel 21 in the position of the flux of light which reflected the aperture diaphragm 25 by the prism 27 after passage, and carried out outgoing radiation in the direction parallel to the direction of outgoing radiation of

DAHAPURUZUMU 23, and preparing an afocal variable power lens in this lens-barrel like the form of the 1st operation. Moreover, although it is possible to be in tolerance and to move a reflecting prism 27 and a lens-barrel in the direction of outgoing radiation of a reflecting prism 26, since the eclipse of an image will arise if tolerance is exceeded, it is not desirable. Moreover, although movement within tolerance is possible also for an aperture diaphragm 25, if tolerance is exceeded, the difference of the luminosity of right and left by the image surface will become size. An observer can choose freely the position of the incident-light shaft orientations of an eye point, and the shift direction, and a suitable eye point is obtained by movement of such a lens-barrel etc. In this case, you may adjust by inserting the specific unit for detaching an interval not among adjustment [****] but among the reflecting prisms 26 and 27. According to this means, interference of a lens-barrel which has a lobe can be prevented.

[0051] Drawing 4 is drawing showing the optical system of the division section (subobservation side) which made the example the trichotomy formula in the form of operation of the 2nd of the stereoscopic microscope of this invention. the example to which it was made, as for the form of this operation, for the eye point by the side of subobservation on either side to become low -- it is -- therefore, optical division -- the angle of the flux of light which carries out outgoing radiation receives horizontally, and it is made to become 30 degrees from a member 31, and is made for the flux of light which carries out outgoing radiation from this roof prism 33 to become horizontal with the reflecting prism 32 and the 2 times reflective roof prism 33 by the side of subobservation Moreover, with the form of this operation, it has composition which has arranged the lens-barrel 21 further in the image rotator prism 29 and the wedge prism 30 like the form of the 1st operation after the outgoing radiation of a roof prism 33.

[0052] As mentioned above, in the subobservation side of the form of this 2nd operation, the eye point by the side of subobservation is low by having made the angle of emergence of optical division small. Moreover, it is made for the nodal line of the one-way mirror side of right and left of the division prism 31 to have come on extension of the injection optical axis of the 2nd lens 14 of a relay system. Only a subobservation side can be rotated, as the axis of rotation is set as this optical axis and it is shown in 68 of drawing 4 . In this case, although the boundary of a reflector does not come on the injection optical axis of the 2nd lens 14 of a relay system, the boundary of this reflector is included in the reflector within the injection flux of light.

[0053] Although each of the 1sts described above, drawing 1 which shows the form of the 2nd operation, or drawing 4 are illustrating only one optical axis, they are optical system which all consist of optical system for the object for left eyes, and right eyes, therefore has the optical path (optical axis) of two right and left. In addition, the optical system by the side of the main observation shown in the optical system, drawing 2 , and drawing 3 by the side of the subobservation shown in drawing 1 or drawing 4 can be combined and used freely, respectively. Moreover, the optical system by the side of subobservation of drawing 4 is possible also for making it the composition divided into right and left by the axis of rotation 69, and can also replace and use one of the optical system by the side of subobservation for the optical system by the side of subobservation of drawing 1 in this case. Thus, when it divides into two optical system, it becomes possible to rotate independently the optical system by the side of each subobservation as well as drawing 1 . In addition, also in drawing 1 , one of the optical system by the side of subobservation can also be transposed to the optical system by the side of subobservation of drawing 4 .

[0054] Next, in the stereoscopic microscope of this invention, it is what obtained the stereogram image using a solid photography system, and the form of the 3rd operation which is the form of implementation of the composition to which it was made equivalent [this stereogram image] to an observation image is described.

[0055] Drawing 5 is the perspective diagram of the form of operation of the 3rd of the stereoscopic microscope of this this invention. In this drawing, 34L and 34R are [the reflective member (a reflecting prism, a total reflection prism, reflective mirror) of an observation system on either side, 39L and 41L, and 39R and 41R of the image formation lens of an observation system on either side, 35L, 36L, 37L, 38L and 40L, and 35R, 36R, 37R, 38R and 40R / respectively] relay optical system on either side respectively.

[0056] In the optical system to illustrate the optical path for left eye observation Penetrate photography system image formation lens 34L, and it reflects in the direction perpendicular to the field which contains the optical axis of photography system image formation lens 34L by reflective member (reflecting prism) 35L. It reflects in the photography optical axis for left eyes of the incidence of 35L, and injection perpendicularly. reflective

member (reflecting prism) 36L -- reflection -- a member -- it reflects in the photography optical axis for left eyes of the incidence of 35L, and injection perpendicularly -- having -- a degree -- reflection -- a member -- 36L -- reflection -- a member -- It is reflected in the direction parallel to the photography optical axis for left eyes of left eye image formation lens 34L passage by 37L. reflection -- a member -- the reflector of reflective member (reflecting prism) 38L -- reflection -- a member -- 36L and reflection -- a member -- it turns in the direction parallel to the photography optical axis for left eyes between 37L -- having -- the reflector of reflective member (reflecting prism) 40L -- reflection -- a member -- 35L and reflection -- a member -- the flux of light is turned in the direction parallel to the photography optical axis for left eyes between 36L moreover, the reflection which attached reflective member (reflecting prism) 42L according to the position of a television camera -- the case where are a member and a small television camera is attached -- it is not necessary to prepare -- reflection -- a member -- you may attach on extension of the injection optical axis of 40L Moreover, 59R is an image pck-up side by the side of a left eye.

[0057] on the other hand -- the observation system for right eyes -- the flux of light -- image formation lens 34R for left eyes -- after [transparency] reflection -- a member -- the reflector of 35R -- reflection -- a member -- 35L and reflection -- a member -- it reflects in opposite direction to the field containing the optical axis for right-and-left photography which is parallel to the photography optical axis for left eyes between 36L, and carries out incidence the flux of light reflected in respect of this -- reflection -- a member -- the reflector of 36R -- reflection -- a member -- 36L and reflection -- a member -- it is parallel to the photography optical axis for left eyes between 37L, and is reflected in the direction of the same direction next, the flux of light -- reflection -- a member -- the reflector of 37R -- reflection -- a member -- 35R and reflection -- a member -- it is parallel to 36R and turns to opposite direction -- having -- reflection -- a member -- 38R -- reflection -- a member -- 37L and reflection -- a member -- it is parallel to 38L and reflects in the same direction -- having -- reflection -- a member -- 40R -- reflection -- a member -- 40L and reflection -- a member -- it is furthermore, the flux of light -- reflection -- a member -- 42R -- the reflection for left eyes -- a member -- depending on the size of a television camera, you may omit like 42L Moreover, 59R is an image pck-up side by the side of a right eye.

[0058] Right-and-left both optical system of the rotation of image by rotation of a prism system on either side described above corresponds with photography optical system on either side like.

[0059] The lens system of the aforementioned right-and-left photography optical system needs to set an aperture diaphragm in the cubic-effect adjustment drawing 3 and a conjugate position. Therefore, the image of an aperture diaphragm needs to be made to be formed out of a photography system. Therefore, the need of arranging the relay lens to which image formation is carried out once inside a photography system, and image formation of this image is carried out again is **. And what is necessary is to set a television photography system at this 2nd image formation point, and just to photo an image. An aperture diaphragm is placed between this 1st image formation point and the 2nd image formation point, an image is taken out to the exterior of a photography system, and it relays to the cubic-effect adjustment drawing 3 and a conjugate position.

[0060] The example of the above-mentioned relay system is shown.

[0061] Drawing 6 and drawing 7 show the example of the optical path for the left eyes of this relay system, and have the following data. Example 1r1 =52.2595 d1 =3.8000 n1 =1.52249 nu1 =59.84 r2 =-25.8263 d2 =2.2000 n2 =1.61293 nu2 =36.99 r3 =-92.6980 d3 =4.0000r4 =infinity d4 =20.0000 n3 =1.56883 nu3 =56.36 r5 =infinity d5 =19.0000 n4 =1.56883 nu4 =56.36 r6 =infinity d6 =40.5000 r7 =infinity d7 =13.0000 n5 =1.56883 nu5 =56.36 r8 =infinity d8 =8.5000r9 =infinity d9 =12.0000 n6=1.56883 nu6 =56.36 r10=infinity d10=19.0000 r11=infinity d11=11.0000 n7 =1.56883nu7 =56.36 r12=infinity d12=5.8000r13=infinity (drawing) d13=7.7000r14=16.7708 d14=3.1404 n8 =1.69680 nu8 =55.53 r15=144.6710 d15=4.3618r16=79.2665 d16=1.5331 n9 =1.67270 nu9 =32.10 r17=9.0778 d17=3.0000r18=12.3898 d18=3.9647 n10=1.58913 nu10=61.14 r19=-62.1435 d19=4.0000r20=infinity d20=21.7300 n11=1.56883 nu11=56.36r21=infinity d21=31.5000r22=infinity (image)

[0062] Example 2r1 =48.7360 d1 =5.0000 n1 =1.48749 nu1 =70.23 r2 =-30.5370 d2 =2.0000 n2 =1.83400 nu2 =37.16 r3 =-57.0210 d3 =4.0000r4 =infinity d4 =20.0000 n3 =1.56883 nu3 =56.36 r5 =infinity d5 =20.0000 n4 =1.56883 nu4 =56.36 r6 =infinity d6 =30.5000 r7 =infinity d7 =12.0000 n5 =1.56883 nu5 =56.36 r8 =infinity d8 =10.0000r9 =infinity d9 =12.0000 n6=1.56883 nu6 =56.36 r10=infinity d10=18.0000 r11=infinity d11=2.5000 n7 =1.51633nu7 =64.14 r12=-35.4270 d12=3.0000r13=infinity d13=12.0000 n8 =1.56883 nu8 =56.36

r14=infinity d14=3.0000r15=infinity (drawing) d15=14.9936 r16=14.4950 d16=3.1000n9 =1.63980 nu9 =34.46 r17=30.3850 d17=4.0121r18=-25.5920 d18=2.0000 n10=1.72825nu10=28.46 r19=10.6910 d19=4.5100r20=31.4850 d20=1.4500n11=1.80518 nu11=25.42 r21=17.0410 d21=3.3800 n12=1.81600 nu12=46.62 r22=-17.0410 d22=11.2749r23=infinity d23=21.2450n13=1.56883 nu13=56.36 r24=infinity d24=33.5830r25=infinity (image)

A relay lens and 43L of the reflecting prism and 41L which show the example 1 of a relay system to drawing 6 , show 34L to an image formation lens and all show Plates 35L, 36L, 37L, 38L, and 40L to drawing 5 are aperture diaphragms.

[0063] the afocal flux of light to which this example 1 injected the afocal system 7 by image formation lens 34L -- reflection -- after passing along Members 35L and 36L -- reflection -- a member -- image formation is carried out to the interior of 37L reflection after image formation -- Members 38L and 40L -- after transparency, the cubic-effect adjustment drawing 3, and a conjugate position -- aperture-diaphragm 43L -- preparing -- the back -- reflection -- a member -- relay lens 41L for carrying out re-image formation of the image formed in 37L -- arranging -- this relay lens 41L -- reflection -- a member -- 42L is penetrated, and it is constituted so that image formation may be carried out to image pck-up side 59L

[0064] although the observation system for right eyes of the observation system and composition for left eyes is also the same -- reflection -- the arrangement positions of a member differ the object for left eyes, and a little namely, -- an example 1 -- reflection -- a member -- 37R is in 7.5mm body side of reflective members from 37L moreover, reflection -- a member -- 38R is in 9.5mm image side of reflective members from 38L On the other hand in the example 2, 37R is in 4.5mm body side from 37L. Moreover, 38R is in 13.5mm image side from 38L. anyway, reflection of the observation optical system for right eyes and the observation optical system for left eyes -- arrangement of a member can be carried out to uninfluential arrangement like drawing 5 to an image formation performance, without changing the optical path length

[0065] Since this example 1 does not have the parallel chief ray which injects a relay system, although it is satisfactory using the veneer television camera using the mosaic filter, if 3 board television camera using 3 color-separation prism is used, color shading will occur.

[0066] The example 2 of a relay system is the composition shown in drawing 7 , and carries out image formation of the afocal flux of light which injects the afocal zoom system 7 in the middle of the parallel plates (reflective member) 37L and 38L by image formation lens 34L. this flux of light -- reflection -- a member -- 38L -- relay lens 39L after passage -- reflection -- a member -- re-image formation is carried out behind 42L At this time, the flux of light which injects relay lens 41L is a tele cent rucksack.

[0067] Thus, an example 2 is characterized by the flux of light which injects relay lens 41L being a tele cent rucksack, and even if it uses the color-separation prism by the interference film by this, it can suppress generating of color shading. That is, relay lens 39L has composition which made it the tele cent rucksack and was amended by the fitness of aberration.

[0068] Like the stereoscopic microscope of this invention, it is it that there is a difference of the image of right and left of a scale factor, such as a focal position, hard coming to observe a stereoradiography system except for a gap of the image of right and left by parallax. Therefore, generally the same thing is used, therefore optical system on either side needs to make in agreement the optical path length on either side. Moreover, it is necessary to miniaturize in limits -- a position is decided with the configuration of a television camera. Furthermore, as for the optical system of this invention, it is effective to arrange optical system so that an overall length becomes long, there may be little mechanical movement for the reason and the optical path length can moreover be taken enough.

[0069] Therefore, it is desirable to make it the composition in which two or more reflectors are included, the optical axis from incidence to injection is located on a flat surface, the optical axis of incidence and injection becomes parallel, and the travelling direction of light becomes a retrose.

[0070] the optical system shown in drawing 5 -- the reflection from the composition from injection of reflective member (reflecting prism) 36L to the incidence of a relay lens, and injection of reflective member (reflecting prism) 35R -- a member -- it is arrangement as the section to the optical axis to the incidence to 36R is the above When this moves a reflective member in the direction of an optical axis, only the length of the double precision of movement magnitude changes the optical path length, and is effective for adjustment of the optical path

length.
[0071] moreover, the composition shown in drawing 5 -- setting -- the optical path for left eyes -- reflection -- a member -- 37L and reflection -- a member -- 38L is moved in the direction of an parallel optical axis, that is, it moves in an arrow 63 and the 64 directions -- making -- moreover, the optical path for right eyes -- reflection -- a member -- 36R and reflection -- a member -- it is also effective to move 37R, that is, to make it move in an arrow 65 and the 66 directions, and to use Furthermore, if it is made to make the aforementioned flat surface intersect perpendicularly by the photography optical path on either side, a three-dimensional protrusion can be suppressed small and it is desirable. moreover, reflection -- when considering Members 35L, 36L, 35R, and 36R etc. as fixation, as for 35L, and 36L, 35R and 36R, it attains [the miniaturization of the whole optical system etc.] and is desirable to make it join In addition, each example of the aforementioned relay system joins 35L, 36L, and 35R and 36R.
[0072] the optical division whose field including the incident-light shaft for eyes on either side shows this stereoradiography system to drawing 10 -- the field containing the incident-light shaft of a member 8, and the reflected optical axis -- being parallel -- and optical division -- reflection of a member 8 -- if it is made for photography system image formation lens 34R to come to a member 9 side, the sense of the image by the side of subobservation can be doubled with the same direction the main observation side
[0073] optical division of the optical system which shows the above stereoradiography systems of composition in this invention to drawing 10 -- since it considers arranging behind a member 8, the reflection by the reflective member of a photography system is odd times However, since the number of times of reflection until it carries out incidence to a photography system is even times when attaching this photography system in lens-barrel 21 position for observation in drawing 1 - drawing 4 and photoing it An image turns into a back image and the position of the cubic-effect adjustment drawing 3 and an aperture diaphragm stops suiting. Therefore, the number of times of reflection is doubled, and in order to maintain a conjugate relation for an aperture diaphragm and the cubic-effect adjustment drawing 3, the reflective member of odd reflection needs to be made to be attached instead of a lens-barrel in front of the image formation lenses 34L and 34R of a stereoradiography system.
[0074] Next, the optical system of composition of having provided with the television picture two or more observers who are the gestalten of operation of the 4th of the stereoscopic microscope of this invention is explained.
[0075] The above-mentioned trichotomy describes the gestalt of the implementation of composition which enabled it to observe a television picture using the optical system of this invention simultaneously observed by three observers.
[0076] Drawing 8 shows the composition which can observe the aforementioned television picture, and is set to drawing. The image formation lens for observation for eyes on either side, and 45L and 45R 44L and 44R, respectively The reflective section, For a reflective member, and 50L and 50R, an image insertion member, and 51L and 51R are [46L, 47L and 46R and 47R / an image rotator, 48L and 48R, and 49L and 49R / display, and 53L and 53R of an ocular, and 52L and 52R] image formation lenses.
[0077] In the optical system by the side of a left eye, the afocal flux of light carries out incidence of the lens-barrel for observation of composition of being shown in drawing 8 , and image formation is carried out to image formation lens 44L with this lens. reflection -- after reflecting in the direction perpendicular to an incident-light shaft by the member 45 and reflecting in the image rotators 46L and 47L 5 times inside incidence Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne., it injects on the extension wire of an incident-light shaft the flux of light injected from image rotator 47L here -- reflection -- a member -- after reflecting in 48L 3 times inside incidence Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne., it is parallel to an incident-light shaft, and the direction of incidence is injected to an opposite direction the flux of light injected from this reflecting-prism 48L -- reflection -- a member -- incidence is carried out to 49L, and it is reflected in the right-angled direction, and injects this reflection -- a member -- after reflecting in 49L, the image formation point by image formation lens 44L is located Expansion observation of the image formed of this image formation lens 44L is carried out by ocular 51L at a left eye.
[0078] Moreover, expansion observation is completely carried out by the same operation in a right eye through ocular 51R also about a right eye side.

[0079] In the above optical system, an image rotator can be made to an erect image by rotating the optical axis as the axis of rotation so that an image may turn into an erect image by the image rotators 46L and 47L, and 46R and 47R.
[0080] In drawing 8 , since it has indicated that the composition is intelligible, although it does not become an erect image in the image rotator of the state of this drawing, it is the arrangement which rotated 90 degrees around the axis of rotation in fact.
[0081] doing angle theta rotation of an image rotator around the axis of rotation, in order to change a tilt angle here -- the reflection after an image rotator -- an inclination can be made adjustable, without rotating an image by doing 2theta rotations of from member 48L to ocular 51L around the same axis of rotation
[0082] moreover -- in order to perform interpupillary-distance adjustment of an ocular -- reflection -- from member 49L up to ocular 51L -- reflection -- a member -- it can carry out by making it move to the incident-light shaft orientation of 29L
[0083] Moreover, in order to maintain this **, ocular 51L also moves in the direction of an optical axis with movement of interpupillary-distance adjustment.
[0084] Moreover, in order to display the picture photoed by the stereoradiography system, it is constituted so that Display 52L and 52R may be installed in a lens-barrel and this may be doubled with the image surface of oculars 51L and 51R by relay lenses 53L and 53R.
[0085] thus, image insertion -- a member -- the picture of a photography system is observable to ocular 51L as it is with 50L Moreover, a reflected type liquid crystal display besides a liquid crystal display monitor is sufficient as display 52L. moreover, image insertion -- a member -- a change mirror and when 50L uses it, changing, and compounding, a one-way mirror is used
[0086] furthermore, the case where a television image pck-up system is prepared in the main observation side -- reflection -- what is necessary is just to make it attach in the subobservation side of those who do not use by right and left of the three-person observation, when arranging behind a member 8 and preparing in a **** observation side As for the subphotography system which attached the photography system of the inside by the side of this subobservation, it is desirable to double the sense of an image with the subobservation system by the side of other subobservation. therefore, the reflective member of the odd times reflection attached before this subphotography system -- reflection -- a member -- what is necessary is just to make it the field (field containing an optical axis) formed of an internal optical axis become the field and parallel containing the optical axis of right and left of a subphotography system Furthermore, what is necessary is just to double the left eye photography system of a subphotography system with the injection optical path for right eyes of a subphotography system. It is a subobservation side by this, and even if it changes to a photography picture, the image of the same direction can be obtained. Although the parallax by the difference of an actual observation image and an opening position generates this photography picture, the difference is few and it is satisfactory practically.
[0087] A **** observation side sets the axis of rotation as a lens-barrel, and rotates the shaft on extension of the injection optical axis of the 2nd lens 14 of the relay system of lens-barrel incidence for it. You make it this rotation interlocked with, and the optical axis of the afocal zoom system 7 is rotated for the photography optical system for the main observation sides as the axis of rotation. moreover, a subobservation side The relation of the image of a subphotography system and a subobservation system can be maintained by making the subobservation side of right and left of trichotomy prism into one, and rotating the optical axis of 2nd lens 14 injection of a relay system as the axis of rotation. moreover, reflection -- when rotating the incident-light shaft of a member 28 as the axis of rotation, right-and-left linkage can be carried out and it can move so that the difference of the sense of the image of a subobservation system and a subphotography system may not come out
[0088] Moreover, interlock is unnecessary in order that rotation of the lens-barrel by the image rotator 29 may not move the optical axis by the side of a body. Therefore, when attaching a solid photography system in the image rotator 29, as for the image rotator 29 or image pck-up equipment, it is desirable to make it fix.
[0089] Even if it attaches a solid photography system and picture insertion equipment on either side by making it the above composition, a bird clapper does not have an observer's eye point highly, and both two observers, the main observer and a vice-observer, can get the television observation image in a good cubic effect.
[0090] In the stereoscopic microscope of this invention, the stereoscopic microscope indicated in each term of a

degree besides the composition indicated to a claim can also attain the purpose of invention.
[0091] (1) The stereoscopic microscope characterized by making it the image pck-up direction of the aforementioned solid image pck-up system change with the stereoscopic microscope indicated to the claim 2 of a claim according to change of the observation direction of the aforementioned lens-barrel optical system.
[0092] (2) The stereoscopic microscope characterized by having been arranged in the flux of light divided by the optical division member by which at least one solid photography system has been arranged with the stereoscopic microscope indicated in the aforementioned term of (1) between an afocal variable power system and a 1-time image formation relay system by the aforementioned variable power system consisting of an afocal variable power system and a relay system.
[0093] (3) A stereoscopic microscope with the common image pck-up equipment which formed the image pck-up equipment which equipped the flux of light after injecting the aforementioned 1-time image formation relay system with other image pck-up systems with the stereoscopic microscope indicated in the aforementioned term of (2), and was equipped with the image pck-up system in the flux of light divided by this image pck-up equipment and the aforementioned optical division member.
[0094] (4) the stereoscopic microscope indicated to the claim 1 of a claim -- the aforementioned optical division -- the stereoscopic microscope characterized by making it in agreement [the position where the field which extended the optical parting plane or the optical parting plane of a member crosses] with the optical axis of the aforementioned variable power optical system
[0095] (5) the stereoscopic microscope indicated in the aforementioned term of (4) -- the aforementioned optical division -- the stereoscopic microscope characterized by having the image rotator which uses in common the optical axis it is decided by the aperture diaphragm for observation of an eye on either side, respectively that two or more reflected light bunches reflected by the optical parting plane of a member will be
[0096] (6) The stereoscopic microscope which carries out the feature of having had the reflective member for having image formation optical system, both the aforementioned image formation optical system consisting of same lenses, and each of 1st optical path of the above and 2nd optical path of the above making the sense and scale factor of an image in agreement in the aforementioned solid image pck-up system with the stereoscopic microscope indicated to the claim 3 of a claim.
[0097] (7) between openings and the image points which are between the image formation point inside a solid image pck-up system, and the image surface with the stereoscopic microscope indicated in the aforementioned term of (6) -- a lens -- arranging -- a photography system -- a tele cent rucksack -- it is -- having made -- a stereoscopic microscope
[0098] (8) The stereoscopic microscope characterized by the number of times of reflection of a solid image pck-up system enabling it to change to odd times and even times with the stereoscopic microscope indicated in the aforementioned term of (7).
[0099] (9) The stereoscopic microscope characterized by making it the 1st optical axis which the 1st optical path of the above and the 2nd optical path of the above have at least two reflectors, respectively, and carries out incidence to one of the aforementioned reflectors with the stereoscopic microscope indicated to the claim 3 of a claim, and the 2nd optical axis which carries out outgoing radiation from the aforementioned reflector become parallel.
[0100] (10) The stereoscopic microscope characterized by making it the 1st flat surface which contains the 1st optical axis of the above and the 2nd optical axis of the above in the 1st optical path of the above with the stereoscopic microscope indicated in the aforementioned term of (9), and the 2nd flat surface containing the 1st optical axis of the above and the 2nd optical axis in the 2nd optical path of the above cross mutually.
[0101] (11) The stereoscopic microscope characterized by making it the 1st flat surface of the above and the 2nd flat surface of the above intersect perpendicularly with the stereoscopic microscope indicated in the aforementioned term of (10).
[0102] (12) the optical division member which has the optical parting plane which divides the flux of light from the aforementioned variable power optical system into transparency and reflection with the stereoscopic microscope indicated to the claim 2 of a claim -- two or more -- having -- the aforementioned lens-barrel optical system -- the aforementioned optical division -- the stereoscopic microscope characterized by connecting with one of members and connecting the aforementioned solid image pck-up system to other optical division

members

[0103][Effect of the Invention] The stereoscopic model of the same scale factor can be observed with the same visual field by two or more observers in a respectively legible position, and it may be made for each observer's eye point to come to the position near a body moreover according to the stereoscopic microscope of this invention. Moreover, the stereoscopic microscope equipped with the solid photography equipment [according to this invention, it is small, and it is possible to perform few observation of the laterality of an image, and] which can also be attached instead of being a lens-barrel can be realized. Moreover, the stereoscopic microscope equipped with this image pck-up equipment can also bring an eye point close to a body, and observation by the observation image or the television picture which is not broken is possible by two or more observers.

[Translation done.]